

It is proposed that the existing IL 71 be removed and replaced by a 2-span, open abutment bridge about 82 ft long (Bk to Bk). The existing structure is a 2-span, closed abutment bridge about 62 ft long (Bk to Bk). The low beam elevation will be raised approximately 2 inches to raise the existing grade slightly and allow for future overlays of the approach roadway. Since there is no freeboard at the structure, a variance is recommended because the existing roadway is located within the Illinois River floodways, is very level with good site distance, and there are no accounts of maintenance problems caused by flooding at the site. The Illinois River runs adjacent to IL 71 and is classified as a Public Body of Water; thus, the proposed construction will require a Part 3704 Permit. A waiver of policy is also required for neither meeting the 2 ft clearance policy nor the 3 ft freeboard policy.

The structure is skewed 30° and is in good alignment with the channel. However, since the channel was realigned during the construction of the existing bridge, the east span of the bridge has silted in and the main channel now runs through the west span of the bridge. The proposed bridge will be shifted slightly west and will employ a 30° skew angle. This can be seen on the attached existing and proposed elevation view sheet.

Realistically, the east side of the channel will not be excavated as shown in the proposed plans. Rather, the east abutment will be "toed" into the existing ground line. I outlined the new proposed opening on the attached existing and proposed elevation view sheet. This obviously decreases the proposed opening area (compared to original proposed opening), but it is still greater than the existing opening area. I altered the HEC-RAS data to account for the change in my model.

I only made a few other changes to the consultant's HEC-RAS model. I added cross sections through interpolation and adjusted/slightly increased the channel Manning's n values in the model. I utilized the consultants flow rates, which were computed from the USGS regression equations and I also made use of the consultant's reach boundary conditions which were taken from the FEMA FIS model and from survey data. A Q_{10} tailwater (elevation 464.7 ft) from the Illinois River was used as the starting water surface for the analysis. I also included a WIT which corresponds to a no tailwater effect from the Illinois River.

My HEC-RAS model resulted in slightly higher natural HWE's due to the changes I made to the model and to the design of the opening. My existing waterway openings were equivalent to those calculated by the consultant. My overtopping frequency, 30 yr, was slightly lesser than the consultants, 35 yr. It appears deceiving on the consultant's WIT because the low grade elevation is at 465.8 ft and the overtopping elevation is at 466.6 ft.

This is because the low grade point is about 600 ft west of the subject crossing and is actually within the floodways of an adjacent stream. The consultant used a slightly higher elevation (taken at a point closer to the bridge crossing) as the determiner for overtopping frequency. I used an elevation which corresponds to the subject stream, 466.6 ft, as the low grade elevation. The only recorded overtopping event was in 1989 or 1990 when there was 10 to 12 inches of water on the roadway. This corresponds to an elevation of about 466.8 ft.

Upstream of the crossing (approximately 500 ft) there is a farmhouse with a low floor elevation of 470.7 ft and water well at elevation 468.0 ft. With a Q_{10} tailwater on the Illinois River, the Q_{500} backwater elevation around the vicinity of the house is about 468.1 ft. The house is safe but the flood water is slightly encroaching upon the water well.

The computed contraction scour for the proposed structure is negligible. The computed pier scour for the proposed structure is 4 ft, 5 ft, and 5 ft for the 50-year, 100-year, and 500-year events respectively. The average velocity for the 50-year frequency is 5.6 ft/s.

As mentioned earlier, this bridge will require a Part 3704 Permit since the structure lies in the Illinois River floodplain. The proposed structure neither meets our policy's 2-ft minimum clearance criteria nor our 3-ft minimum freeboard criteria and will require a waiver of policy that verifies the need for the incongruity.

The estimated water surface elevation is 462.8 ft and was estimated from a picture out of the HR.

Please note that this site would make a good 3-side bridge location due to the fact that there is rock near the surface.

The proposed bridge geometry is subject to modification in the TSL stage of the project.

Hydraulic Procedure Summary

Route: FAP 627 (IL 71)
 Section: 177-2
 County: La Salle
 Date: 03/05/2004

S.N.: 050-0030 (exist.)
 S.N.:
 Waterway: Stream
 By: P S K

Hydrology/Discharges			
	Units	USED	District Units
Drainage Area	Sq. Mi	<=()= =(x)=>	7.0 Sq. Mi
Slope	ft./mi.	<=()= =(x)=>	39.1 ft./mi.
Method		<=()= =(x)=>	USGS Reg. Eq.
Q10	CFS	<=()= =(x)=>	1370 CFS
Q50	CFS	<=()= =(x)=>	2110 CFS
Q100	CFS	<=()= =(x)=>	2420 CFS
Qot	1830 CFS	<=(x)= =()=>	1935 CFS
Q500	CFS	<=()= =(x)=>	3160 CFS
Comments:			
High Water Elevations			
Method		<=()= =(x)=>	HEC-RAS
Cross Sections		<=()= =(x)=>	Surveyed/USGS Quad. Map
Overbank 'n'		<=()= =(x)=>	0.05-0.08
Channel 'n'	0.04	<=(x)= =()=>	0.035
Slope/Elevation		<=()= =()=>	
Source of Slope		<=()= =()=>	
Comments: Q ₁₀ tailwater of Illinois River used as downstream starting watersurface			
Backwater			
Skew		<=()= =(x)=>	30°
Overflows		<=()= =()=>	
Method		<=()= =(x)=>	HEC-RAS
Datum:			
Scope of Work: Removal and Replacement			
IDNR Permit Type Required: Individual - Part 3704 Permit			
IDOT Policies: 2' Min. Vert. Clearance: Does Not Meet			
3' Min. Freeboard: Does Not Meet			
EWSE: 462.8			

WATERWAY INFORMATION TABLE*

Route: FAP 627 (IL 71)
 Section: 177-2
 County: La Salle
 Date: 03/05/04

S.N.: 050-0030 (exist.)
 S.N.:
 Waterway: Stream
 By: P S K

Exist. Low Grade Elevation: 466.6 ft. @ Sta. 98+ 00

Drainage Area =		7.0	mi ²	Prop. Low Grade Elevation:		466.6	ft.	@ Sta. 98+ 00	
	Freq. Yr.	Q ft ³ /s	Opening - ft ²		Nat. H.W.E.	Head - ft.		Headwater Elev.	
			Exist.	Prop.		Exist.	Prop.	Exist.	Prop.
	10	1370	257	329	465.5	0.6	0.4	466.1	465.9
Design	50	2110	257	329	466.2	0.9	0.7	467.1	466.9
Base	100	2420	257	329	466.5	0.6	0.5	467.1	467.0
Overtop _{Exist}	20	1690	257	329	465.8	0.8		466.6	
Overtop _{Prop}	30	1830	257	329	465.9		0.7		466.6

10 Year Velocity through Existing Bridge = 5.3 fps 10 Year Velocity through Proposed Bridge = 4.2 fps

ALL-TIME H.W.E. & DATE: 466.8 ft in 1989 or 1990

SCOPE OF WORK: Removal and Replacement

Datum:

PROPOSED STRUCTURE

TYPE: Spill-Thru
 LENGTH: 82'-11" Bk. to Bk. Abut's
 SPANS: 2
 L. BEAM: 464.9
 SKEW: 30.0°

EXISTING STRUCTURE

TYPE: Closed
 LENGTH: 61'-8" Bk. to Bk. Abut's
 SPANS: 2
 L. BEAM: 464.7
 SKEW: 30.0°

* Q10 Illinois River tailwater used as starting water surface elevation

NOTE: PROPOSED STRUCTURE DETAILS ARE PRELIMINARY; SUBJECT TO REFINEMENT IN TSL STAGE.

WATERWAY INFORMATION TABLE*

Route: FAP 627 (IL 71)
 Section: 177-2
 County: La Salle
 Date: 03/05/04

S.N.: 050-0030 (exist.)
 S.N.:
 Waterway: Stream
 By: P S K

Exist. Low Grade Elevation: 466.6 ft. @ Sta. 98+ 00

Drainage Area =		7.0	mi ²	Prop. Low Grade Elevation:		466.6	ft.	@ Sta.	98+ 00
	Freq. Yr.	Q ft ³ /s	Opening -		Nat. H.W.E.	Head -		Headwater Elev.	
			Exist.	Prop.		ft ²	Exist.	Prop.	Exist.
	10	1370	257	329	465.1	0.6	0.4	465.7	465.5
Design	50	2110	257	329	466.1	1.0	0.9	467.1	467.0
Base	100	2420	257	329	466.4	0.9	0.8	467.3	467.2
Overtop _{Exist}	30	1830	257	329	465.7	0.9		466.6	
Overtop _{Prop}	35	1935	257	329	465.8		0.8		466.6

10 Year Velocity through Existing Bridge = 5.3 fps 10 Year Velocity through Proposed Bridge = 4.2 fps

ALL-TIME H.W.E. & DATE: 466.8 ft in 1989 or 1990

SCOPE OF WORK: Removal and Replacement

Datum:

PROPOSED STRUCTURE

TYPE: Open Abutment
 LENGTH: 82'-11" Bk. to Bk. Abut's
 SPANS: 2
 L. BEAM: 464.9
 SKEW: 30.0°

EXISTING STRUCTURE

TYPE: Closed Abutment
 LENGTH: 61'-8" Bk. to Bk. Abut's
 SPANS: 2
 L. BEAM: 464.7
 SKEW: 30.0°

* No tailwater effects used

NOTE: PROPOSED STRUCTURE DETAILS ARE PRELIMINARY; SUBJECT TO REFINEMENT IN TSL STAGE.

TO: FILE

FROM: Paul S. Kmett

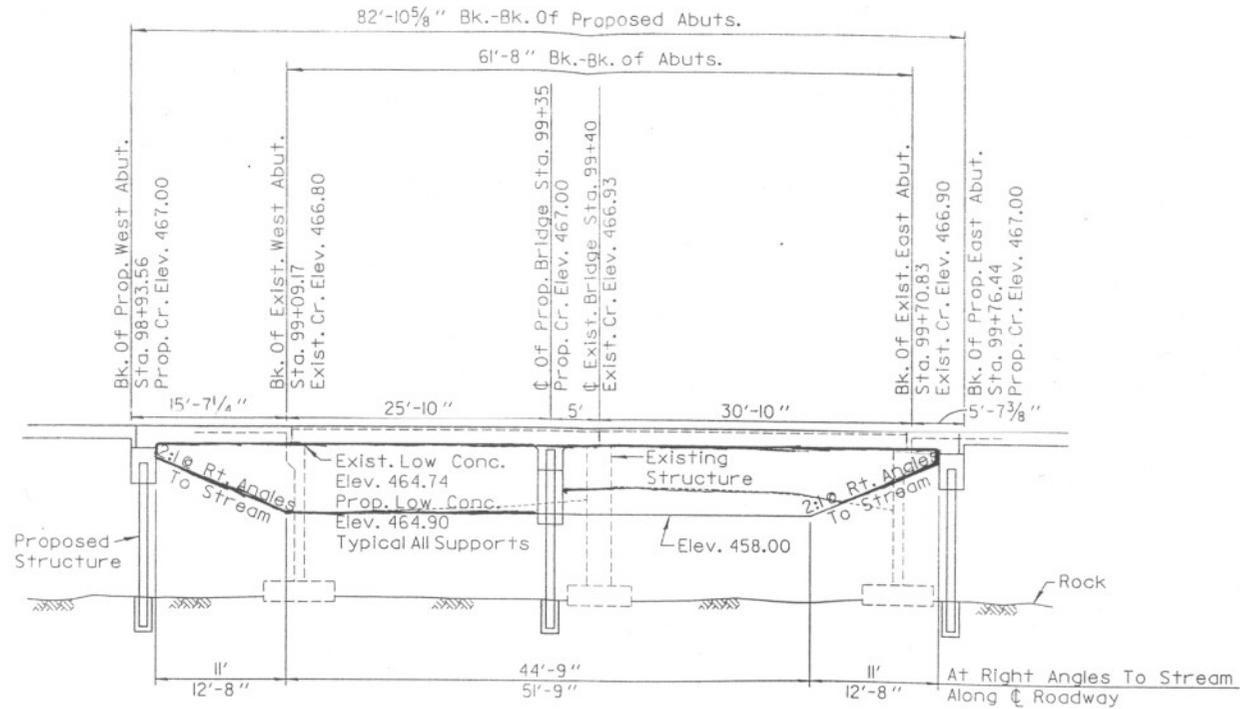
SUBJECT: IL 71 over Unnamed Stream \ Illinois River Public Water Identification

DATE: March 5, 2004

Note to Planner:

This location involves a Public Water as defined by the Department of Natural Resources and requires a "Public Water" identification in the Title Block of the project plans. The following General Note needs to be included on the final design plans:

"The contractor shall obtain a construction permit from the Illinois Department of Natural Resources (IDNR), Office of Water Resources for any temporary construction activity placed in the water except cofferdams. This shall include the placement of material for run-arounds, causeways, etc. Any permit application by the contractor should refer to the IDNR permit number _____ which was issued for the permanent construction."



EXISTING AND PROPOSED BRIDGE ELEVATION
 (LOOKING NORTH)

Existing Structure:

A Two-Span (2 @ 29'-6") PPC
 Deck Beam Bridge On Closed
 Concrete Abutments And
 Reinforced Concrete Pier, All
 On Spread Footings. 46'-6" O.-O.
 Deck, 61'-8" Bk.-Bk. Abuts.,
 Skewed 30° Right Ahead.

Proposed Structure:

A Two-Span (2 @ 40'-0") Reinforced
 Concrete Slab On Spill-Thru, Pile Bent
 Abutments And Pile Bent Pier, All Piles
 Set In Rock. 47'-2" O.-O. Deck 82'-10 5/8"
 Bk.-Bk. Abuts., Skewed 30° Right Ahead.

EXISTING & PROPOSED
 ELEVATION VIEW
 S.N. 050-0030

Bridge Waterway Opening

Waterway: Stream (Existing)

Pier Information (Average Low Beam = 464.74 ft)

	<u>Pier Width</u>	<u>Bottom Elev.</u>	<u>Area(L.B.)</u>
Pier 1	3.00 ft	460.70 ft	12.12 ft ²

Pier Width at Right Angle to Stream

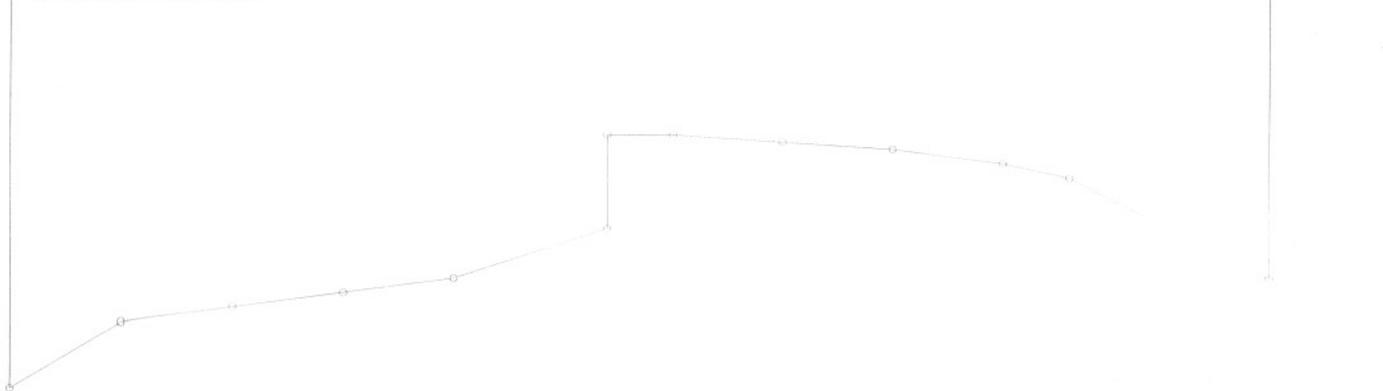
Waterway Opening (Skew of Opening = 30° Cross Section Assumed Parallel to Structure)

<u>Frequency</u>	<u>H.W.E.</u>	<u>Gross</u>	<u>Net</u>	<u>Net</u>	<u>Net Under L.B.</u>
10 Year	465.37 ft	266.11 ft ²	254.0 ft²	23.6 m ²	254.0 ft ²
50 Year	466.03 ft	266.11 ft ²	254.0 ft²	23.6 m ²	254.0 ft ²
100 Year	466.31 ft	266.11 ft ²	254.0 ft²	23.6 m ²	254.0 ft ²
Over Topping	465.87 ft	266.11 ft ²	254.0 ft²	23.6 m ²	254.0 ft ²
500 Year	467 ft	266.11 ft ²	254.0 ft²	23.6 m ²	254.0 ft ²

100 Year

<u>Pt.</u>	<u>L.B.</u>	<u>H.W.E</u>	<u>Station</u>	<u>Ground Elev.</u>	<u>Dist. from Last Pt.</u>	<u>Dep. Below Low Beam</u>	<u>Dep. Below H.W.E.</u>	<u>Area Under Low Beam</u>	<u>Area Under H.W.E.</u>	<u>Area</u>
1	464.74	466.31	990.00	464.74	0.00	0.00	0.00 *	0.00	0.00	0.00
2	464.74	466.31	990.00	457.20	0.00	7.54	7.54 *	0.00	0.00	0.00
3	464.74	466.31	995.00	458.10	5.00	6.64	6.64 *	35.45	35.45	35.45
4	464.74	466.31	1000.00	458.30	5.00	6.44	6.44 *	32.70	32.70	32.70
5	464.74	466.31	1005.00	458.50	5.00	6.24	6.24 *	31.70	31.70	31.70
6	464.74	466.31	1010.00	458.70	5.00	6.04	6.04 *	30.70	30.70	30.70
7	464.74	466.31	1017.00	459.40	7.00	5.34	5.34 *	39.83	39.83	39.83
8	464.74	466.31	1017.00	460.70	0.00	4.04	4.04 *	0.00	0.00	0.00
9	464.74	466.31	1020.00	460.70	3.00	4.04	4.04 *	12.12	12.12	12.12
10	464.74	466.31	1025.00	460.60	5.00	4.14	4.14 *	20.45	20.45	20.45
11	464.74	466.31	1030.00	460.50	5.00	4.24	4.24 *	20.95	20.95	20.95
12	464.74	466.31	1035.00	460.30	5.00	4.44	4.44 *	21.70	21.70	21.70
13	464.74	466.31	1038.00	460.10	3.00	4.64	4.64 *	13.62	13.62	13.62
14	464.74	466.31	1047.00	458.70	9.00	6.04	6.04 *	48.06	48.06	48.06
15	464.74	466.31	1047.00	464.74	0.00	0.00	0.00 *	0.00	0.00	0.00

* Low Beam Governs



Bridge Waterway Opening

Waterway: Stream (Proposed)

Pier Information (Average Low Beam = 464.9 ft)

	<u>Pier Width</u>	<u>Bottom Elev.</u>	<u>Area(L.B.)</u>
Pier 1	3.00 ft	458.00 ft	20.70 ft ²

Pier Width at Right Angle to Stream

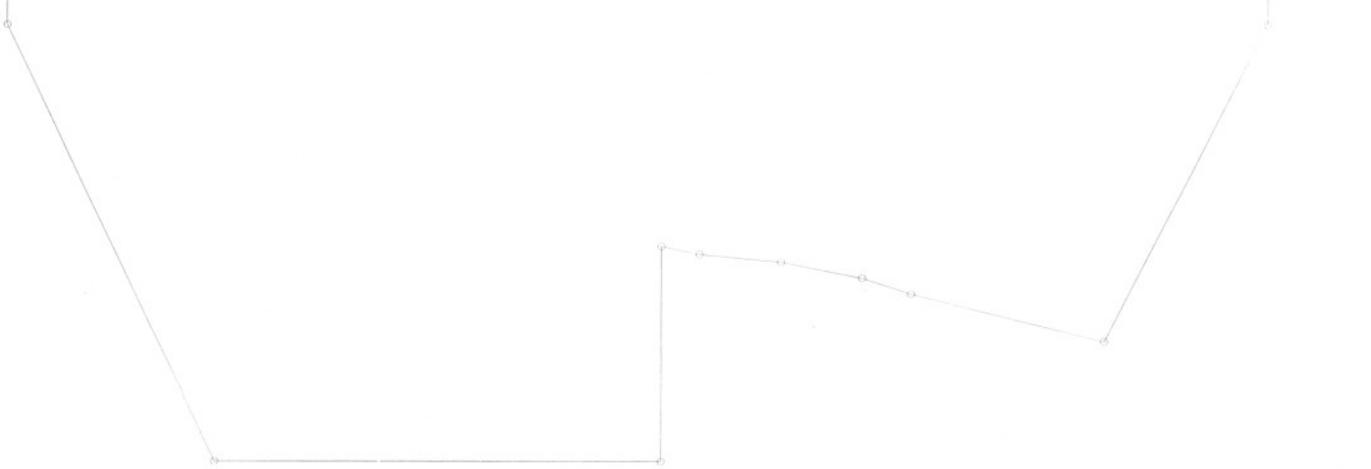
Waterway Opening (Skew of Opening = 30° Cross Section Assumed Parallel to Structure)

Frequency	H.W.E.	Gross	Net	Net	Net Under L.B.
10 Year	465.37 ft	349.56 ft ²	328.9 ft²	30.6 m ²	328.9 ft ²
50 Year	466.03 ft	349.56 ft ²	328.9 ft²	30.6 m ²	328.9 ft ²
100 Year	466.31 ft	349.56 ft ²	328.9 ft²	30.6 m ²	328.9 ft ²
Over Topping	465.37 ft	349.56 ft ²	328.9 ft²	30.6 m ²	328.9 ft ²
500 Year	467 ft	349.56 ft ²	328.9 ft²	30.6 m ²	328.9 ft ²

100 Year

Pt.	L.B.	H.W.E	Station	Ground Elev.	Dist. from Last Pt.	Dep. Below Low Beam	Dep. Below H.W.E.	Area Under Low Beam	Area Under H.W.E.	Area
1	464.90	466.31	982.60	464.90	0.00	0.00	0.00 *	0.00	0.00	0.00
2	464.90	466.31	982.60	463.50	0.00	1.40	1.40 *	0.00	0.00	0.00
3	464.90	466.31	995.27	458.00	12.67	6.90	6.90 *	52.58	52.58	52.58
4	464.90	466.31	1022.65	458.00	27.38	6.90	6.90 *	188.92	188.92	188.92
5	464.90	466.31	1022.65	460.70	0.00	4.20	4.20 *	0.00	0.00	0.00
6	464.90	466.31	1025.00	460.60	2.36	4.30	4.30 *	10.03	10.03	10.03
7	464.90	466.31	1030.00	460.50	5.00	4.40	4.40 *	21.75	21.75	21.75
8	464.90	466.31	1035.00	460.30	5.00	4.60	4.60 *	22.50	22.50	22.50
9	464.90	466.31	1038.00	460.10	3.00	4.80	4.80 *	14.10	14.10	14.10
10	464.90	466.31	1049.79	459.50	11.79	5.40	5.40 *	60.13	60.13	60.13
11	464.90	466.31	1059.68	463.50	9.89	1.40	1.40 *	33.63	33.63	33.63
12	464.90	466.31	1059.68	464.90	0.00	0.00	0.00 *	0.00	0.00	0.00

* Low Beam Governs



Contraction Scour

Stream: Stream
Route \ County: IL 71 / La Salle
S.N. : 050-0030 (Exist.)

PROPOSED STRUCTURE

	<u>Q₅₀</u>	<u>Q₁₀₀</u>	<u>Q₅₀₀</u>
Flow Depth @ APPR (y ₁) ft	8	8	8
Channel Width @ APPR (W ₁) ft	27	27	27
Channel Width @ BRIDG (W ₂) ft	67	67	67
Contracted Channel Flow @ BRIDG (Q ₂) cfs	1383	1726	1247
Main Channel Flow @ APPR (Q ₁) cfs	947	1073	1015
Vratio; ShearV/FallV	2.5	2.5	2.5
Manning's "n" Ratio; Contracted/APPR (n ² /n ₁)	1	1	1
k ₁ =	0.69	0.69	0.69
k ₂ =	0.37	0.37	0.37
y ₂ =	5.9	6.4	5.1
Depth of Contraction Scour, y_(scour) =	0	0	0
	{ft}	{ft}	{ft}

$$y_2 = y_1 \left[\frac{Q_2}{Q_1} \right]^{\frac{6}{7}} \left[\frac{W_1}{W_2} \right]^{k_1} \left[\frac{n_2}{n_1} \right]^{k_2}$$

$$y_{(scour)} = y_2 - y_0$$

Vratio; V _* /ω	k ₁	k ₂	Mode of Bed Material Transport
<0.50	0.59	0.066	Mostly contact bed material discharge
0.50 to 2.0	0.64	0.21	Some suspended bed material discharge
>2.0	0.69	0.37	Mostly suspended bed material discharge

$$V_* = (g y_1 S_1)^{\frac{1}{2}}$$

V* = Shear velocity (ShearV) in upstream section, (fps)

ω = Median fall velocity (FallV) of bed material based on the D₅₀, (fps)

g = Acceleration of gravity, (32.2 ft/s²)

S₁ = Slope of energy grade line of main channel, (ft/ft)

D₅₀ = median diameter of the bed material, (ft)

assumptions \ directions:

- * y₀ = y₁ (y₀ = existing depth at bridge section before scour)
- * Typically Manning's "n" ratio = 1.0 and the channel width ratio = 1.0
- * To be conservative, V_{*}/ω can be assumed to be 2.5

Pier Scour

Stream:	Stream
Route \ County:	IL 71 / La Salle
S.N.:	050-0030

PROPOSED STRUCTURE

		Q_{50}	Q_{100}	Q_{500}
Attack angle of flow (theta)	deg.	0	0	0
Length of pier (L)	ft	47	47	47
Width of pier (a)	ft	2.5	2.5	2.5
Average Velocity (V)	fps	3.6	3.8	4.7
Depth of flow at pier (y_1)	ft	9	9	9
Pier type code	(1 thru 5)	2	2	2

(maximum = 12) L/a =	12	12	12
K_1 =	1.0	1.0	1.0
K_2 =	1.0	1.0	1.0
K_3 =	1.1	1.1	1.1
K_4 =	1.0	1.0	1.0
Fr =	0.211	0.223	0.276
Depth of Pier Scour, y_s =	4	5	5

{ft} {ft} {ft}

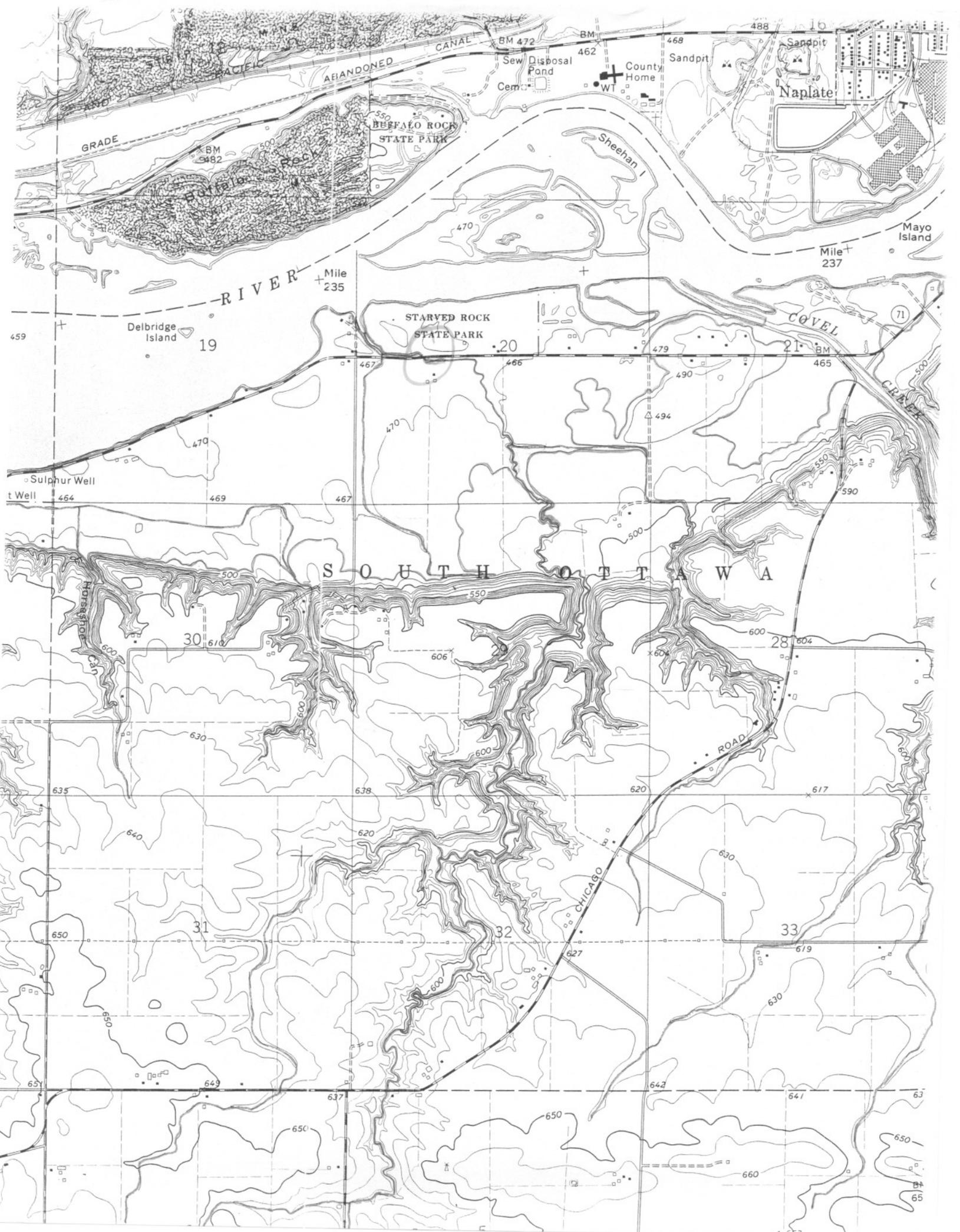
$$\frac{y_s}{a} = 2.0K_1K_2K_3K_4 \left(\frac{y_1}{a} \right)^{0.35} Fr^{0.43}$$

$$Fr = \frac{V}{(gy_1)^{\frac{1}{2}}}$$

assumptions \ directions: The correction factor for pier nose shape is taken from

- * Table 2. However, for an attack angle > 5 degrees, K_1 is equal to unity. In that case, use pier type code 2.
- * K_2 is computed with the formula located below Table 3.
- * K_3 is set at 1.1, which represents the absence of dunes or a dune bed configuration with crest heights under 10 feet. (See Table 1 & HEC-18) Adjust this accordingly for dune heights > 10 feet.
- * K_4 is computed using Table 4 and the equations below Table 4.

NOTE: This spreadsheet computes pier scour under the assumption the footing or pile cap is not exposed by some combination of contraction scour, long-term degradation or stream migration. If that is not the case, then scour due to the footing or pile cap may control. See Chapter 6 of HEC-18.





ILLINOIS DEPARTMENT OF TRANSPORTATION

HYDRAULIC REPORT

ROUTE: FAP 627 (IL 71)

SECTION: U-BR

COUNTY: LASALLE

EXIST. S.N.: 050-0030

PROP. S.N.: NOT ASSIGNED

CONTRACT NO.: NOT ASSIGNED

CATALOG NO.: NOT ASSIGNED

JOB NO.: NOT ASSIGNED

P- 93-047-02

**LOCATION: ILLINOIS ROUTE 71
OVER STREAM**

Prepared By

WILLETT, HOFMANN & ASSOCIATES, INC.

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HEC-RAS Files

Project File	il71.prj
Natural Run	il71.p04 il71.g02 il71.f01 and il71.f03
Existing Run	il71.p03 il71.g01 il71.f01
Proposed Run	il71.p06 il71.g04 il71.f03

NARRATIVE

Project Description

This project consists of the replacement of SN 050-0030 carrying IL 71 (FAP 627) over Intermittent Stream 5.9 miles east of IL Route 178 in LaSalle County, IL.

The purpose of this report is to analyze the present hydraulic conditions and compare the natural condition with the existing and proposed condition.

Description of Existing Structure and Floodplain

The existing structure is a 2-span precast prestressed concrete deck beam structure, on a reinforced concrete pier and closed concrete abutments, all on spread footings set in rock. The structure is skewed 30° right ahead.

The total length of the bridge is 61'-8" back-back of abutments, along the centerline of the roadway and 53'-5" back-back of abutments at right angles to the stream. The out-out deck width is 46'-6".

The channel parallels the roadway downstream of the structure and the south downstream overbank is covered with light timber before intersecting the roadway. The north overbank downstream of the structure is timber covered. The upstream overbank areas are cultivated. The upstream channel is consistent and well aligned to the structure, except the stream flows along the face of the west abutment. No channel modifications are needed in the proposed structure.

There is a confluence with the Illinois River approximately 3000 feet downstream.

There are no sensitive flood receptors at this time.

Special Conditions of Project

There are no special conditions for this project.

Historical Observations

Illinois Department of Transportation District 3 records indicate that there was approximately 10" to 12" of water over the roadway in 1989 or 1990. This corresponds to an elevation of approximately 466.6 to 466.8.

Hydraulic Methodology

Discharges were calculated using USGS Equations as described in the Drainage Manual. The drainage area (A) was taken from a delineated drainage area on USGS quad maps (see exhibit 1). The slope (S) was calculated from the 10%-85% streambed slope taken from the drainage area map, and the intensity (I) and regional factor RF were taken from the charts in the Drainage Manual.

The cross sections were modeled from survey data with a few exceptions. First, the 100' downstream and all three upstream sections were extended based on scaled distances from the quad map due to the fact that the final surveyed elevations were below the calculated water surface elevations. Second the cross

sections immediately upstream and downstream of the bridge were copied from the 100' upstream and 100' downstream cross sections, respectively, and modified accordingly based on the bridge opening survey. Finally, cross sections were interpolated between the 100' and 500' downstream and 500' and 1000' upstream sections, using the HEC-RAS program, to reduce conveyance problems between the sections.

Manning's "n" values were determined from visual inspection of the stream.

Summary of Hydraulic Analysis

Three models were developed using the HEC-RAS water surface-modeling program. The first model computed the natural water surface profiles of the stream. The second model added the roadway embankment and existing bridge opening to show existing conditions. The third model shows the proposed conditions based on the proposed embankment and bridge opening.

The effects of the Illinois River flooding on this structure were investigated by determining if the starting water surface elevations for any of the three models would be influenced by flood elevations at confluence of the intermittent stream and the Illinois River. The Flood Insurance Study water surface profiles for LaSalle County show the Illinois River at the confluence of the stream has a 10-year flood elevation of approximately 464.7 and a 100-year flood elevation of approximately 468.7. These elevations are higher than the starting water surface elevations for all investigated flows at the downstream cross section calculated by the slope-conveyance method in the HEC-RAS program, therefore the 10-year flood elevation for the Illinois River was used in all three models for all flows.

The existing structure was found to overtop at approximately the 20-year flow.

Proposed Structure Analysis

The replacement structure was sized to increase the waterway opening and increase the return period of the overtopping flow. The proposed channel bottom is 44'-9" at right angles to the stream with 2:1 side slopes to existing ground. The proposed bridge will be shifted five feet west of the existing structure and then checked for clearance of the existing footings in the detailed design. The proposed structure was found to overtop at approximately the 35-year flow.

The proposed structure is a 2-span reinforced concrete slab bridge on pile bent spill-thru abutments and a pile bent pier. All piles will be set in rock. The structure will be 82'10 5/8" back-back of abutments along the centerline of roadway and 71'-9" back-back of abutments at right angles to the stream. The structure will be skewed 30° right ahead and the width will be 47'-2" out-out of parapets. The proposed low beam will be slightly higher than the existing low beam elevation.

Scour Analysis

A scour analysis was performed for the existing and proposed conditions. The Analyses produced minimal scour depths that do not reach the rock elevation (see attachment 5).

Conclusion

Based on the hydraulic analysis, the proposed structure improves the hydraulics at this site. The analysis shows that the low beam is below the 50-year design highwater elevation, allowing no freeboard, however only a minor grade change is recommended. Only a minor grade change is recommended because the existing roadway is located in the floodplain of the Illinois River, is very flat with good site distance and there are no records of problems caused by flooding at the site.

WATERWAY INFORMATION TABLE

ROUTE:	FAP 627 (IL 71)	S.N.:	050-0030
COUNTY:	LaSalle	WATERWAY:	Stream
DATE:	10/23/02	BY:	MRL

English Units

Drainage Area = 7.01 sq. mi			Existing Low Grade Elev. 465.81 ft. Proposed Low Grade Elev. 465.81 ft.				@ Sta. 93+00 @ Sta. 93+00		
Flood	Frequency Year	Q ft ³ /s	Waterway Opening ft ²		Natural H.W.E.	Head (ft)		Headwater Elev.	
			Existing	Proposed		Existing	Proposed	Existing	Proposed
-	10	1370	257	383	465.37	0.71	0.36	466.08	465.73
Design	50	2110	257	383	466.03	1.10	0.74	467.13	466.77
Base	100	2420	257	383	466.31	1.05	0.90	467.36	467.21
Overtopping	20	1710	257	-	465.67	0.97	-	466.64	-
Overtopping	35	1935	-	383	465.87	-	0.68	-	466.55
Max. Calc.	500	3160	257	383	467.00	0.44	0.28	467.44	467.23

10 Year Velocity through Existing Bridge = 5.3 fps

10 Year Velocity through Proposed Bridge = 3.6 fps

0.23

DATUM: NGVD
 ALL-TIME H.W.E. & DATE: 468 in 1989 or 1990
 SCOPE OF WORK:

EXISTING STRUCTURE
 TYPE: CLOSED
 LENGTH: 61'-8"
 SPANS: 2 @ 29'-6"
 LOW BEAM: 464.74
 SKEW: 30° RT. AHD.

PROPOSED STRUCTURE
 TYPE: SPILL -THRU
 LENGTH: 82'-10 5/8"
 SPANS: 2 @ 40'-0"
 LOW BEAM: 464.90
 SKEW: 30° RT. AHD.

NOTE: PROPOSED STRUCTURE DETAILS ARE PRELIMINARY; SUBJECT TO REFINEMENT IN TSL STAGE.

JOB SN 050-0030 - 1st Floor Elev. Pickup

JOB T: BS, SS: BS, ϕ

DATE PAGE

DATE 4/23/03 Sunny 60's PAGE 1

	3.55	[470.72] ✓	BNA ELEV. 467.17
OR 1WX	1.00	(469.72) ✓	
OR	.02	(470.70) ✓	
IF W C 24M, 1.52L	1.95	(468.77) ✓	
WENT 52L	2.20	(468.52) ✓	
L	2.70	(468.02) ✓	
	3.55		467.17 ±0.00

CHIS. "D" on SE Wingwall of Exist. Bridge
SN 050-0030 - 26' Rt of STA 99+85

✓ SF 4/23/02

PARTY CHIEF
WEATHER

PARTY CHIEF
WEATHER

HYDRAULIC REPORT DATA SHEETS

Route: FAP 627 (IL 71)
 Section: _____
 County: LaSalle

Existing Str. No.: 050-0030
 Proposed Str. No.: Not Assigned

1. Name of stream Intermittent Stream
2. Location of structure _____ NW _____ $\frac{1}{4}$ of the _____ SW _____ $\frac{1}{4}$, Section _____ 20
- Township: _____ 33N _____ Range: _____ 3E _____ of the _____ 4th _____ P.M.

Site Design Data

3. Drainage area upstream of bridge _____ 7.01 _____ (Sq. Mi.)
4. Character of drainage area . {For areas less than 10 sq. mi.]:
 Cultivated: _____ 35% _____ Pasture: _____ 10% _____ Timber: _____ 55% _____ Urbanized: _____ %
 Other: _____ %
5. Design frequency _____ 50 _____ years. Road Design Classification _____ Federal-Aid Primary
6. Elevation of design frequency high water _____ 466.03 _____ (feet).
7. Maximum known high water elevation _____ 468 _____ (feet). Date _____ 1989 or 1990
8. Cause of maximum known high water (headwater, backwater, etc.) _____ Unknown
9. Flow line elevation _____ 458.0 _____ (feet).
10. Approximate waterway area proposed below design high water _____ 383 _____ Sq. Ft.
11. Elevation of low point on proposed approach roadway. _____ 465.81 _____ (feet).
12. Is any particularly valuable property located upstream within possible bridge backwater influence? Yes: _____ No: _____ x

Describe and list critical upstream flood elevation(s):

Approximately 500 Feet upstream, water well ELEV = 468.02
and first floor ELEV. = 470.70 for the farmhouse southwest
of SN 050-0030. BTG

13. Will drift or ice permit pier in low flow channel? _____ yes
14. Type of streambed soil _____ Sand/Gravel _____ Does it scour easily? _____ no
15. If bridge is proposed, supply abutment type: Closed: _____ Open: _____ x _____ Skew: _____ 30°
16. If culvert is proposed, supply: Type: _____ Length _____ (feet)
 Flow Line Slope _____ % Entrance Type: _____ Skew: _____
17. Is necessity for separate overflow structure(s) indicated by field conditions? _____ No
18. Is reliable information available to unconfined water surface slope during some particular high water stage? Yes _____ No _____ x

HYDRAULIC REPORT DATA SHEETS

Route: FAP 627 (IL 71)
 Section: _____
 County: LaSalle

Existing Str. No.: 050-0030
 Proposed Str. No.: Not Assigned

Slope: _____ (Ft./100 Ft.)

Existing Structure Data

19.	Requested Data	Structure Upstream		Structure Near Site		Structure Downstream	
	Distance From Proposed Structure.		(Mi.)	--	(Mi.)	None	(Mi.)
	Type of Structure.			2 Span Closed Abut			
	Low Beam Elevation.		(Ft.)	464.74	(Ft.)		(Ft.)
	Design Frequency.		(Yr.)	50	(Yr.)		(Yr.)
	Right Angle Waterway Opening Below Design High Water.		(Sq. Ft.)	257	(Sq. Ft.)		(Sq. Ft.)
	Maximum Known High Water Elevation.		(Ft.)	468	(Ft.)		(Ft.)
	Flow Line Elevation.		(Ft.)	458	(Ft.)		(Ft.)
	Date of Maximum High Water.			1990			
	Cause (Backwater, Headwater, etc.).			Unknown			
	Does Structure Carry Entire Design Flood Flow?			No			
	If Not, State Kind and Area of Additional Waterway.		(Sq. Ft.)	Weir Flow 234	(Sq. Ft.)		(Sq. Ft.)
	Has Detrimental Scour Occurred Under or Adjacent To The Structure?			No			
	Apparent Reason For Scouring.			NA			

Required Additional Data

20. Information regarding high water from other streams, reservoirs, flood control projects, proposed channel changes, or other controls affecting proposed waterway area.

21. To be attached:

- a. Reproduction of applicable portion of USGS quadrangle sheet or map of equal detail showing locations of structures described in Item 19 and the proposed structure.
- b. Aerial photo of general site, showing alignment of proposed crossing.
- c. Sketch of waterway opening of existing structure(s) at site.
- d. Streambed profile extending 1,000 feet upstream and downstream from the proposed structure. Indicate profile plan location on map or photo.

HYDRAULIC REPORT DATA SHEETS

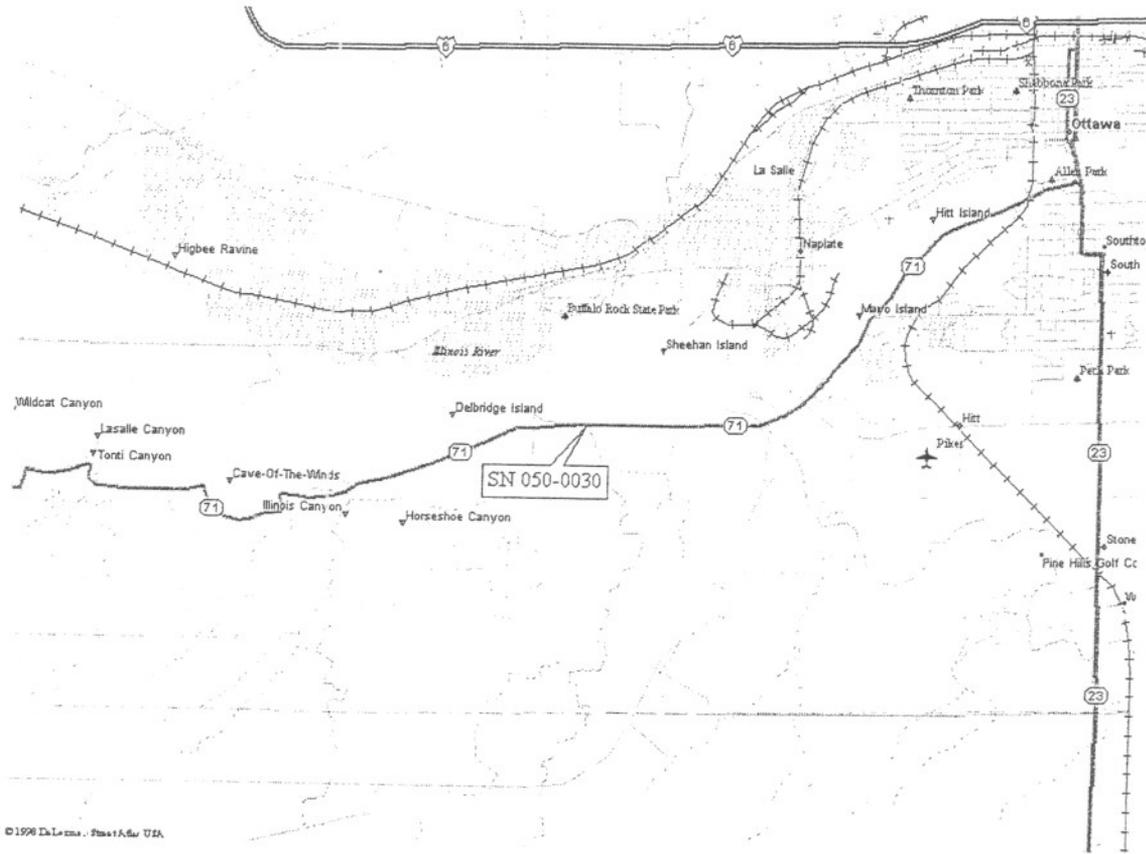
Route: FAP 627 (IL 71)
Section: _____
County: LaSalle

Existing Str. No.: 050-0030
Proposed Str. No.: Not Assigned

- e. Typical right angle channel cross sections, including floodplain above elevation of design high water. Manning's roughness coefficients, descriptions, and boundaries are necessary within each section.
 - f. A stream cross section immediately adjacent and parallel to the roadway taken across the full width of the floodplain.
 - g. If field conditions indicate that channel change is necessary, indicate location, cross section and gradient.
 - h. If available, map showing 1 or 2 meter (1 or 2 foot) contour intervals, stream meanders, vegetation and manmade improvements.
 - i. Identify the datum correlation with other reports (such as the FIS) used in the Hydraulic Report.
22. Site inspection made

by:	_____ MRL _____	Date	_____ 4-14-02 _____
Report prepared by:	_____ MRL _____	Date:	_____ 10-25-02 _____
Remarks:	_____		

LOCATION MAP



IL 71 5.90 MI. EAST OF IL 178
OVER STREAM

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



1) Structure number on inside of north rail



2) Nameplate on inside of north rail

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

3) Looking southeast at upstream floodplain



COMMENTS

4) Looking southeast from structure

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

5) Looking south at upstream floodplain



COMMENTS

6) Looking northwest at downstream floodplain

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

7) Looking northwest from structure



COMMENTS

8) Looking north at downstream floodplain

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

9) Looking east from west of west abutment (at bridge)



COMMENTS

10) Looking east from west abutment (at bridge)

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

11) Looking west from west of west abutment (at alignment)



COMMENTS

12) Looking west from east of east abutment (at bridge)

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

13) Looking west from east abutment (at bridge)



COMMENTS

14) Looking east from east of east abutment (at alignment)

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream

LaSalle County

Existing S. N. 050-0030

Illinois Department of Transportation, District 3

Hydraulic Report



COMMENTS

15) Looking south at structure



COMMENTS

16) Looking north at structure

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

17) View of southwest quad and ditch



COMMENTS

18) View of northwest quad and ditch

PHOTOGRAPHS FOR

FAP 0627 (IL 71) over Intermittent Stream	LaSalle County
Existing S. N. 050-0030	Illinois Department of Transportation, District 3
Hydraulic Report	



COMMENTS

19) View of northeast quad and ditch



COMMENTS

20) View of southeast quad and ditch

$$\text{DRAINAGE AREA} = 4488 \text{ ACRES} / 640 = 7.01 \text{ sq mi.}$$

LENGTH OF DRAINAGE BASIN

$$L = 17'' \times \frac{2000}{5280} = 6.44 \text{ mi}$$

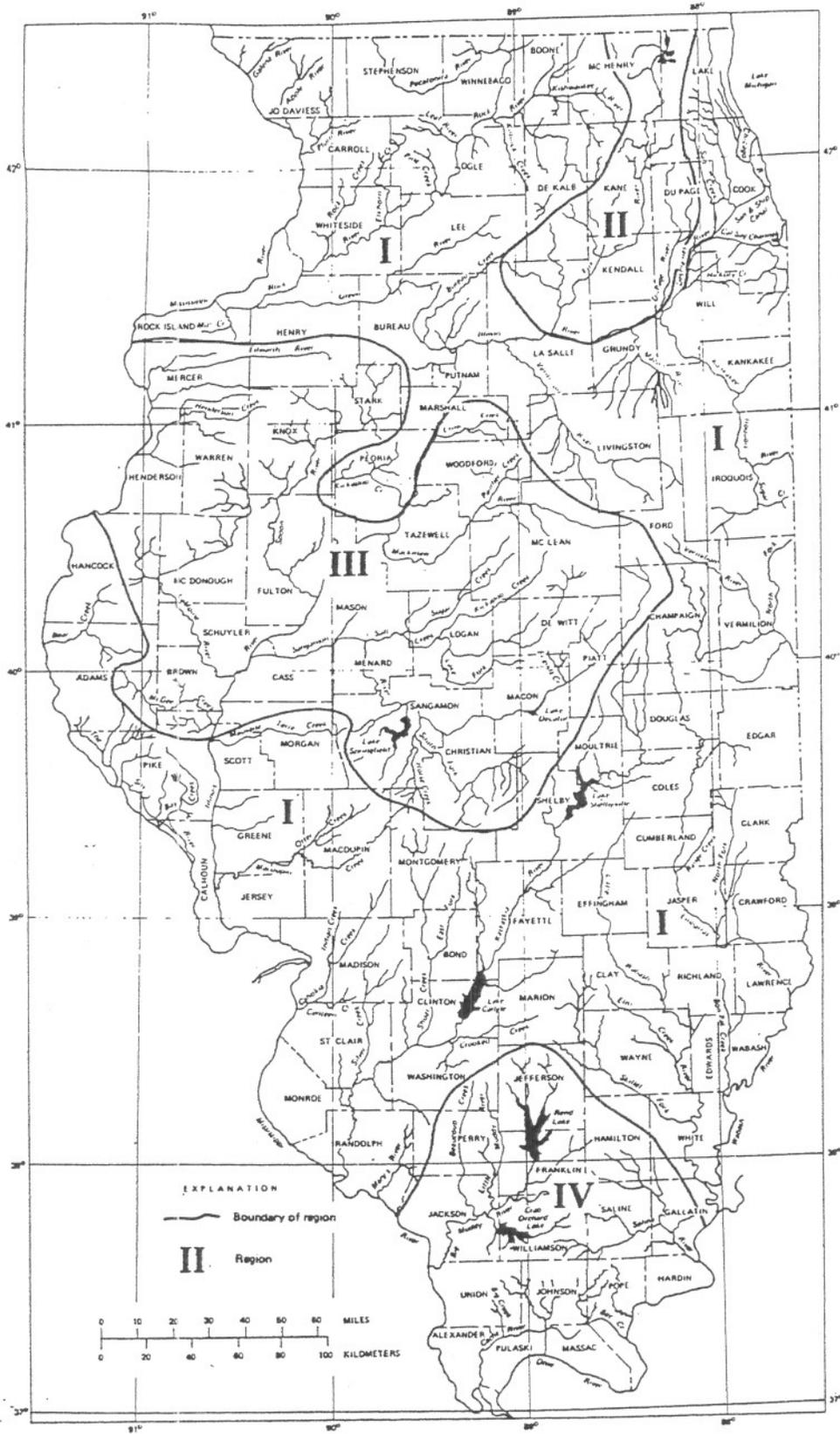
$$10\% \text{ ELEV} = 472 \text{ FT}$$

$$85\% \text{ ELEV} = 661 \text{ FT}$$

$$S = \frac{661 - 472}{0.75(6.44)} = 39.1 \text{ FT/mi}$$

$$I = 2.9$$

REGION I



Geographic regions, R, in Illinois

Figure 4-101.01 d

FLOOD PEAK DISCHARGE CALCULATIONS

IL 71 Over Intermittent Stream
Structure No. 050-0030
LaSalle County
District 3

DRAINAGE AREA (A) = 7.01 Sq. Mi. ✓

SLOPE (S) = 39.1 Ft./Mile ✓

RAINFALL INTENSITY (I) = 2.9 inches ✓

REGIONAL FACTOR (RF) = Region I ✓

$$Q_2 = 38.1 * (A)^{0.790} * (S)^{0.481} * (I - 2.5)^{0.677} * (Rf) = 590 \text{ c.f.s.} ✓$$

$$Q_5 = 63.0 * (A)^{0.786} * (S)^{0.513} * (I - 2.5)^{0.719} * (Rf) = 1,040 \text{ c.f.s.} ✓$$

$$Q_{10} = 78.9 * (A)^{0.785} * (S)^{0.532} * (I - 2.5)^{0.742} * (Rf) = 1370 \text{ c.f.s.} ✓$$

$$Q_{25} = 98.2 * (A)^{0.786} * (S)^{0.552} * (I - 2.5)^{0.768} * (Rf) = 1,790 \text{ c.f.s.} ✓$$

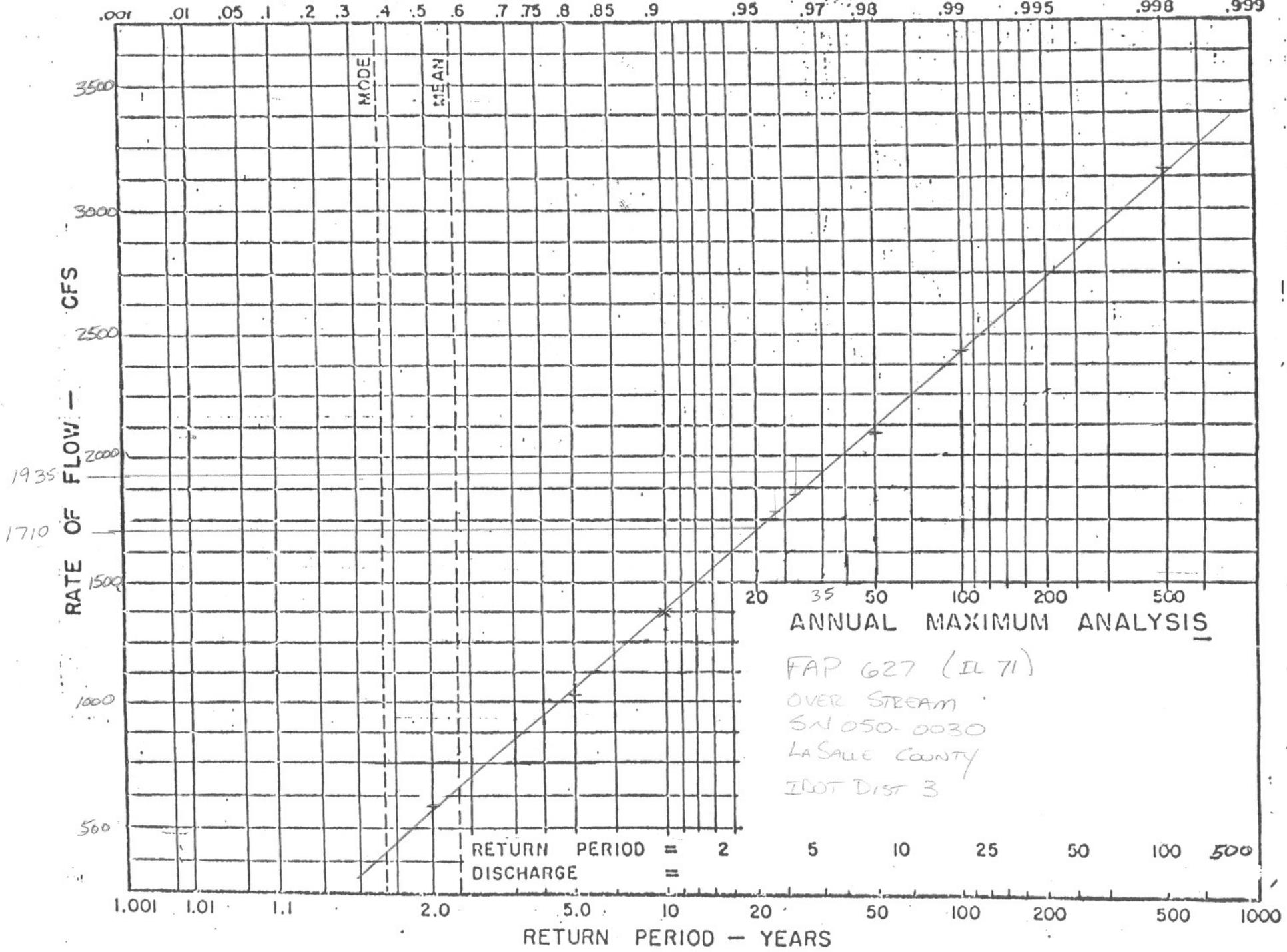
$$Q_{30} = 100 * (A)^{0.786} * (S)^{0.556} * (I - 2.5)^{0.773} * (Rf) = 1,830 \text{ c.f.s.} ✓$$

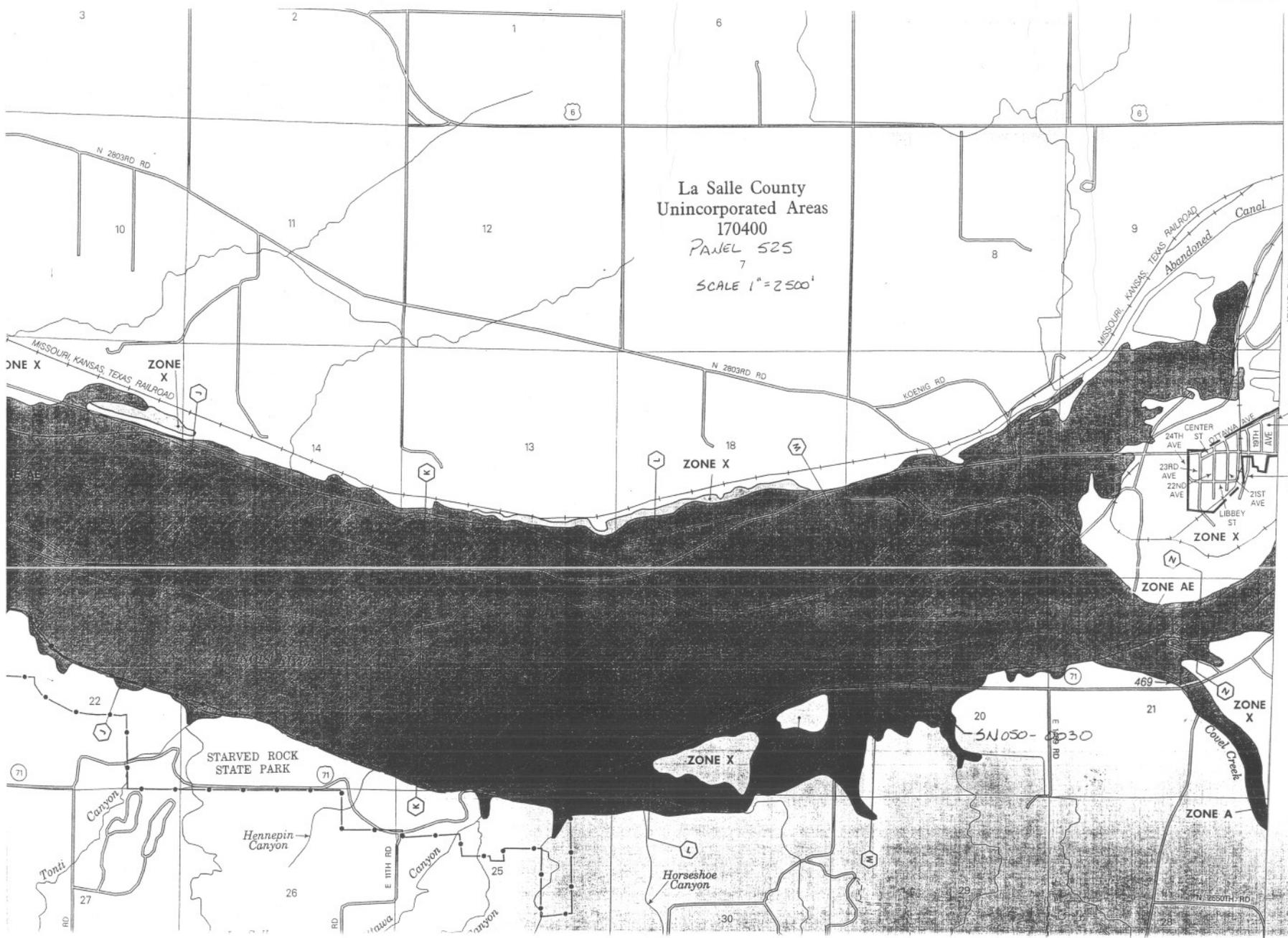
$$Q_{50} = 112 * (A)^{0.786} * (S)^{0.566} * (I - 2.5)^{0.786} * (Rf) = 2,110 \text{ c.f.s.} ✓$$

$$Q_{100} = 125 * (A)^{0.787} * (S)^{0.578} * (I - 2.5)^{0.803} * (Rf) = 2,420 \text{ c.f.s.} ✓$$

$$Q_{500} = 155 * (A)^{0.789} * (S)^{0.601} * (I - 2.5)^{0.838} * (Rf) = 3,160 \text{ c.f.s.} ✓$$

PROBABILITY — F(X)



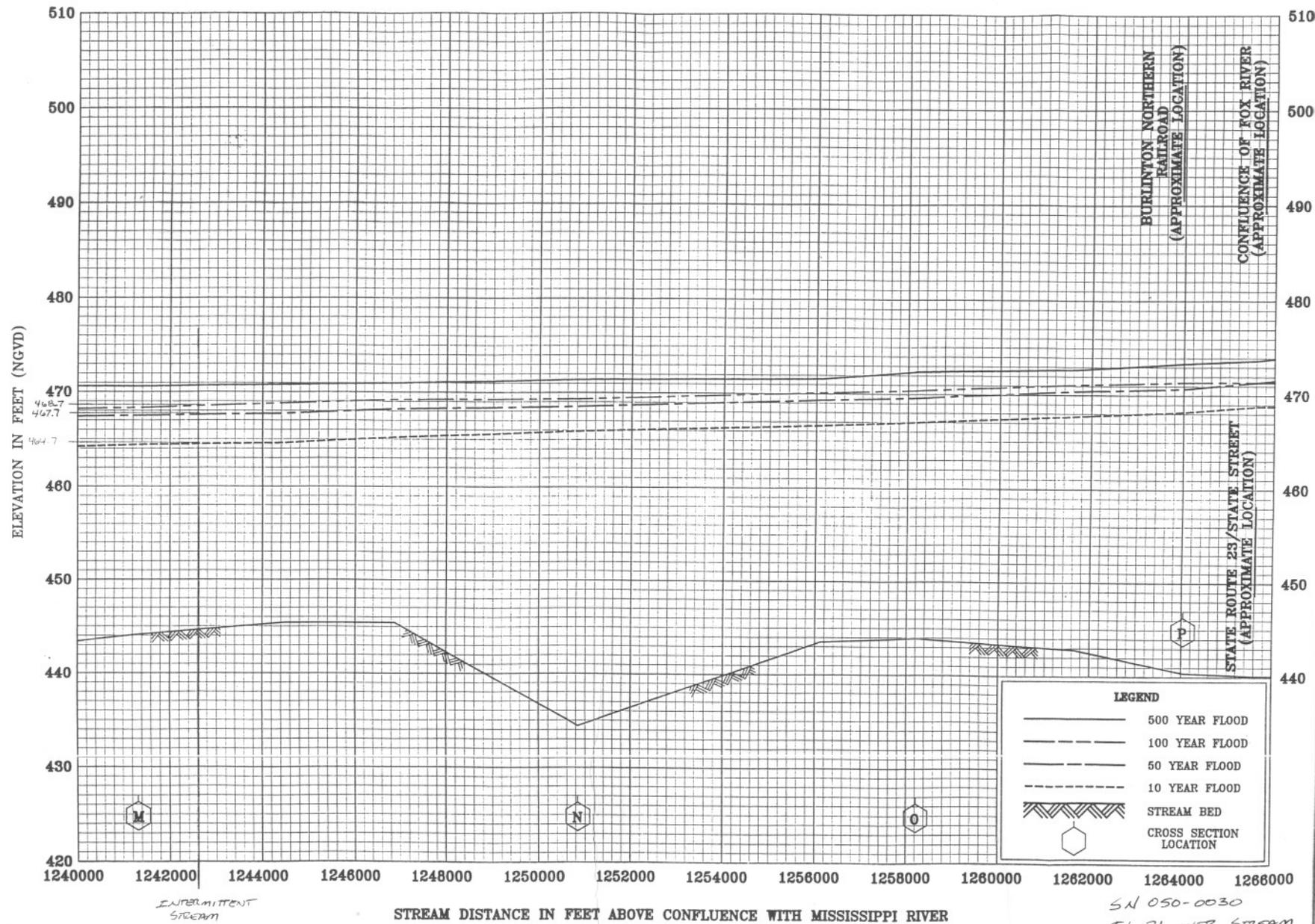


La Salle County
 Unincorporated Areas
 170400
 PANEL 525
 7
 SCALE 1" = 2500'

JOINS PANEL 0530

Village of
 Naplate
 171065

51050-230



FEDERAL EMERGENCY MANAGEMENT AGENCY
 LA SALLE COUNTY, IL
 AND INCORPORATED AREAS
 FLOOD PROFILES
 ILLINOIS RIVER
 22P

SN 050-0030
 IL 71 OVER STREAM

LINEAR REGRESSION CALCULATIONS

IL 71 over Intermittent Stream
Structure No. 050-0030
LaSalle County
IDOT District 3
Streambed Slope

INPUT

STATION (xi)	ELEVATION (yi)
1000	456.7
1100	456.7
1200	456.7
1300	456.3
1400	456.9
1500	456.8
1600	457.5
1700	457.8
1800	458.3
1900	458
2000	458.1
2100	458.1
2200	458.3
2300	458.3
2400	458.2
2500	458.6
2600	458.7
2700	459.8
2800	459.6
2900	460.4
3000	460.5

CALCULATIONS

No. of Points, n =	21
SUM OF xi =	42000.00
SUM OF xi ^2 =	91700000
(SUM OF xi)^2 =	1764000000
x BAR =	2000.00
SUM OF yi =	9620.30
SUM OF yi ^2 =	4407180.69
(SUM OF yi)^2 =	92550172.09
y BAR =	458.11
SUM OF xi*yi =	19254920.00

SLOPE, m =	0.00185974
-------------------	-------------------

LINEAR REGRESSION CALCULATIONS

IL 71 over Intermittent Stream
Structure No. 050-0030
LaSalle County
IDOT District 3
Water Surface Slope

INPUT

STATION (xi)	ELEVATION (yi)
1000	458.7
1100	458.7
1200	458.7
1300	458.8
1400	458.8
1500	458.8
1600	458.8
1700	458.8
1800	458.8
1900	458.8
2000	458.7
2100	458.9
2200	459
2300	458.9
2400	458.9
2500	459.1
2600	459.5
2700	460.4
2800	460.6
2900	461
3000	461.3

CALCULATIONS

No. of Points, n=	21
SUM OF xi =	42000.00
SUM OF xi ^2 =	91700000
(SUM OF xi)^2 =	1764000000
x BAR =	2000.00
SUM OF yi =	9644.00
SUM OF yi ^2 =	4428905.74
(SUM OF yi)^2 =	93006736.00
y BAR =	459.24
SUM OF xi*yi =	19296000.00

SLOPE, m = 0.00103896



Illinois Department of Transportation

Memorandum

To: Tom Sancken Attn: Steve Ferguson
From: Bruce A. Hucker By: T. Schaefer/J. Gromer/F. Bradish
Subject: Pavement/Bridge Flooding Records
Date: July 31, 2001

We have reviewed the flooded pavement files and offer the following information.

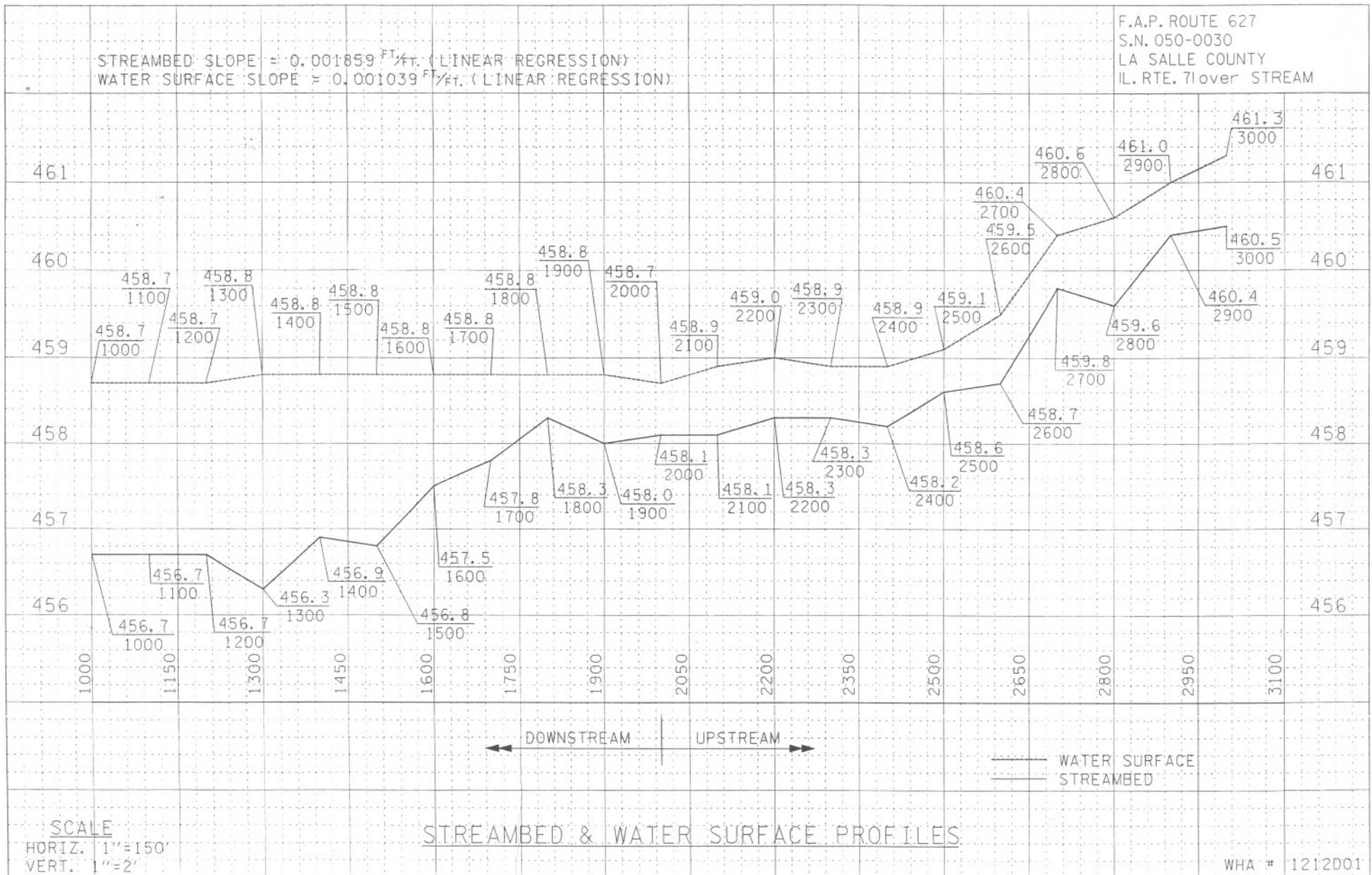
- Structure No. 038-0071; CH 21 over Fountain Creek. This bridge flooded on April 11, 1994 (see attached pictures).
 - Structure No. 038-0101; CH 21 over Fountain Creek. There has been no reports of flooding at this location. (Scour and riprap project at this structure two years ago).
 - Structure NO. 038-0176; CH 21 over Whiskey Creek. There has been no reports of flooding at this location.
 - Structure No. 038-0162; Schwer Road over Jefferson Creek. There has been no reports of flooding at this location.
- Structure No. 050-0030; IL 71 over Stream east of IL 178. Structure had 10 to 12 inches of water on roadway about 1989 or 1990. There has been none since.
- ~~Structure No. 050-0009 and 0010. We have no reports of flooding.~~

If you have any questions, please contact Tom Schaefer at 815-434-8446.

TS:ac
S:\opr\pave flood

STREAMBED SLOPE = 0.001859 FT/FT. (LINEAR REGRESSION)
 WATER SURFACE SLOPE = 0.001039 FT/FT. (LINEAR REGRESSION)

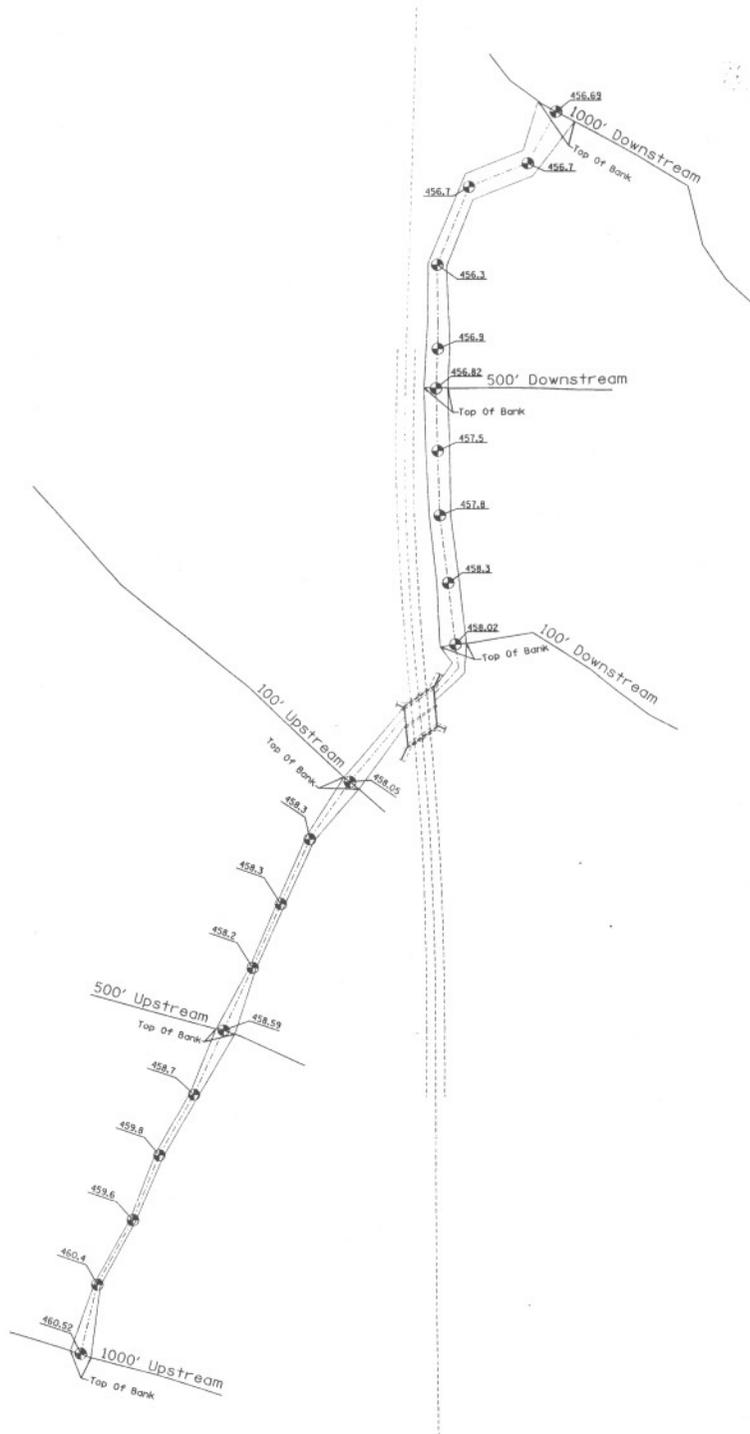
F.A.P. ROUTE 627
 S.N. 050-0030
 LA SALLE COUNTY
 IL. RTE. 71 over STREAM



SCALE
 HORIZ. 1"=150'
 VERT. 1"=2'

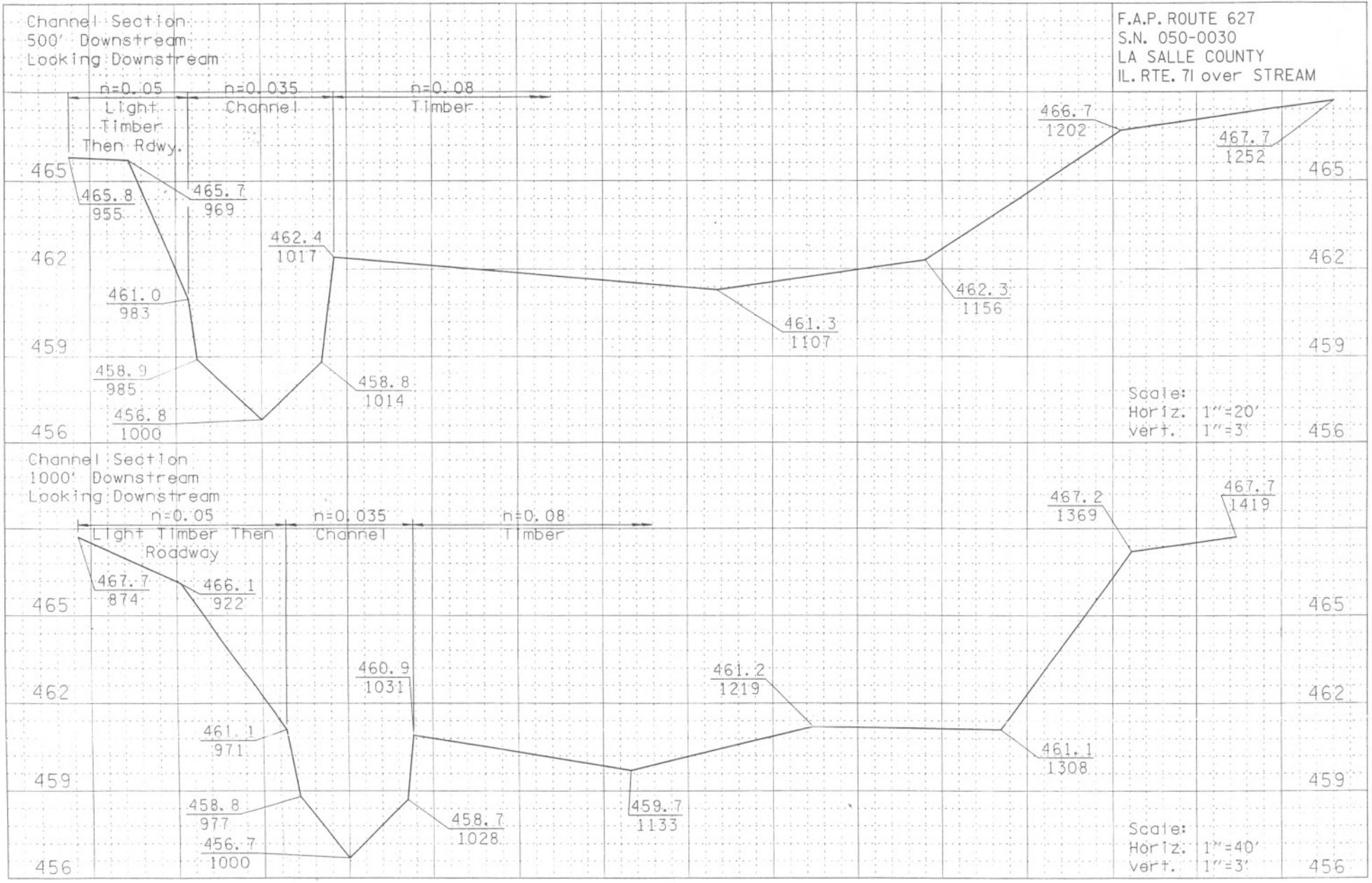
STREAMBED & WATER SURFACE PROFILES

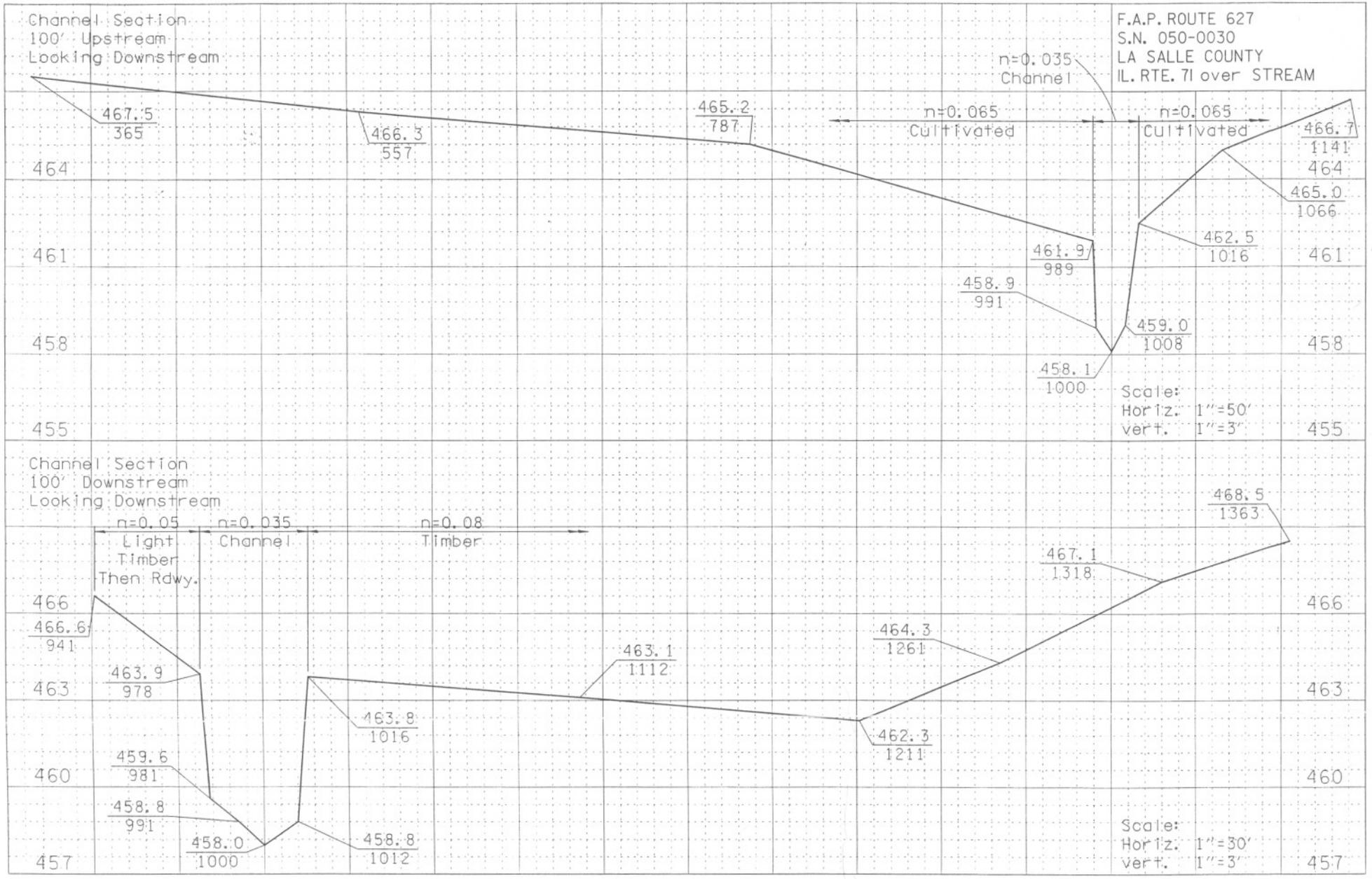
WHA # 1212D01



REVISION	DATE	DESCRIPTION

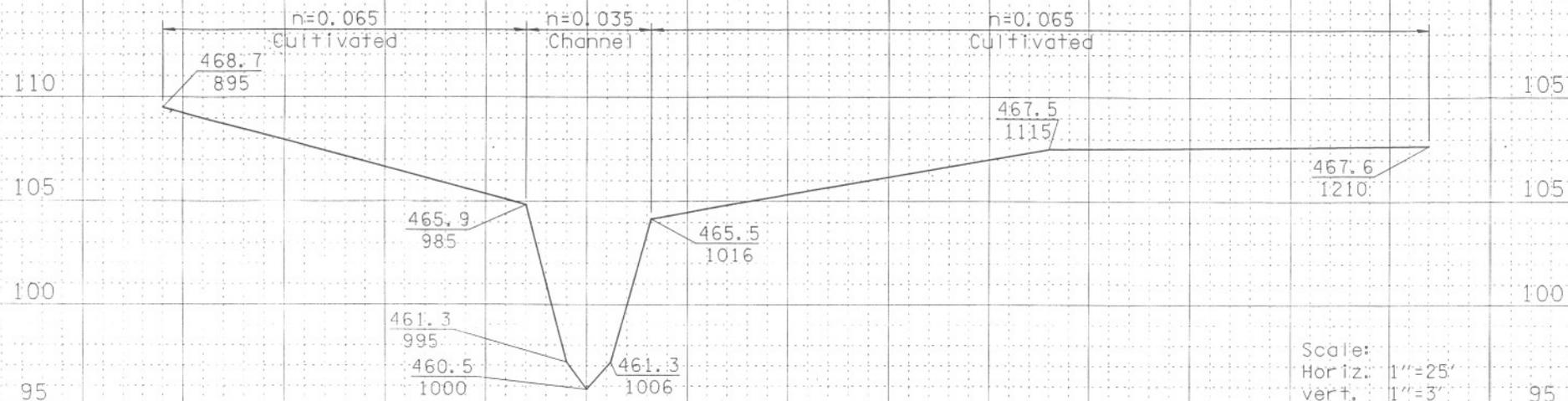
ILLINOIS DEPT. OF TRANSPORTATION
 STREAM VIEW
 ILLINOIS ROUTE 71 OVER STREAM
 S.N. 050-0030
 DATE 10/29/2002
 DRAWN BY: S.D. ALLEN
 CHECKED BY: M.R. LESLIE



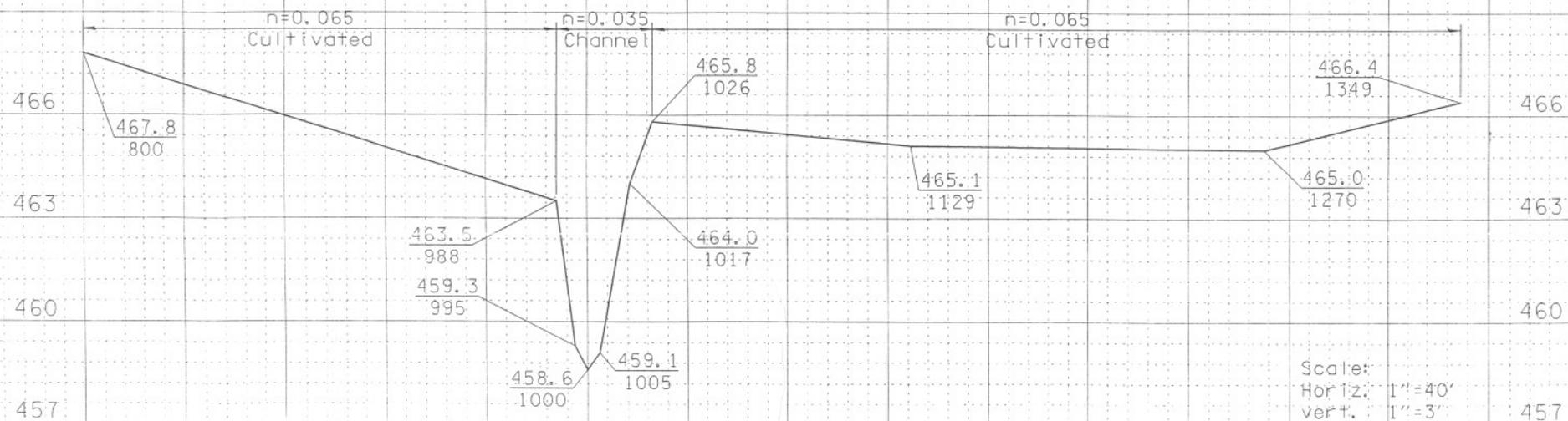


Channel Section
1000' Upstream
Looking Downstream

F.A.P. ROUTE 627
S.N. 050-0030
LA SALLE COUNTY
IL. RTE. 71 over STREAM

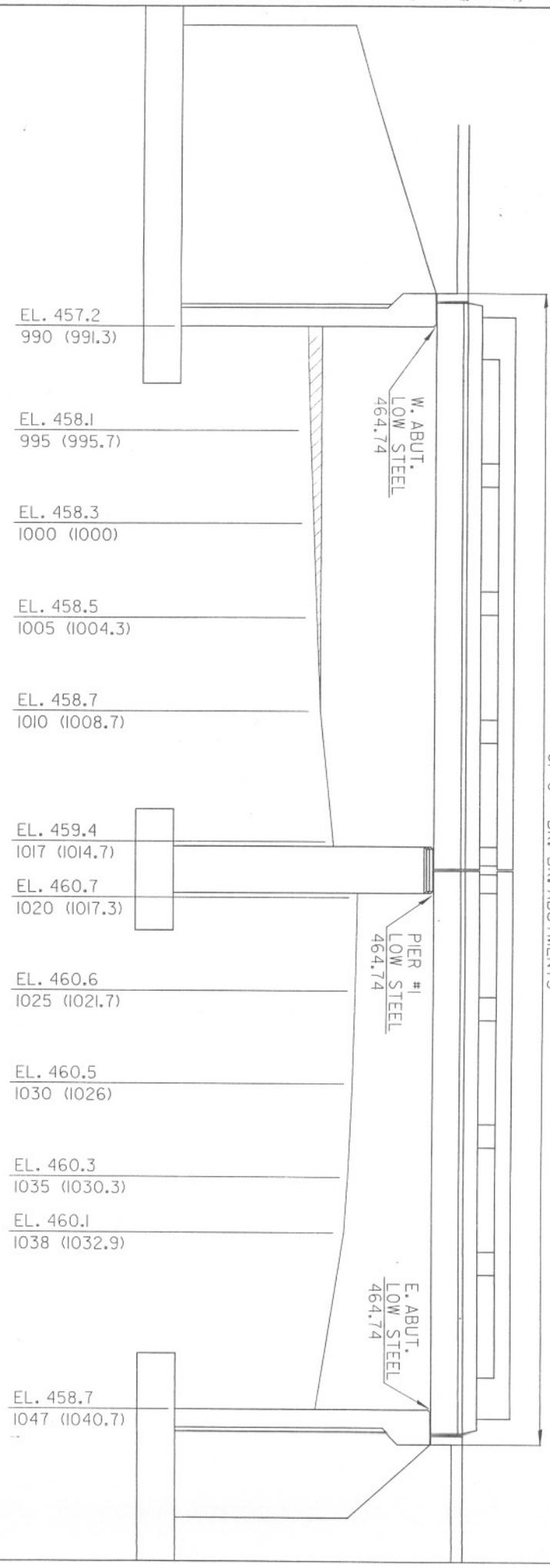


Channel Section
500' Upstream
Looking Downstream



F.A.P. ROUTE 627
 S.N. 050-0030
 LASALLE COUNTY
 I.L. RTE 71 over STREAM

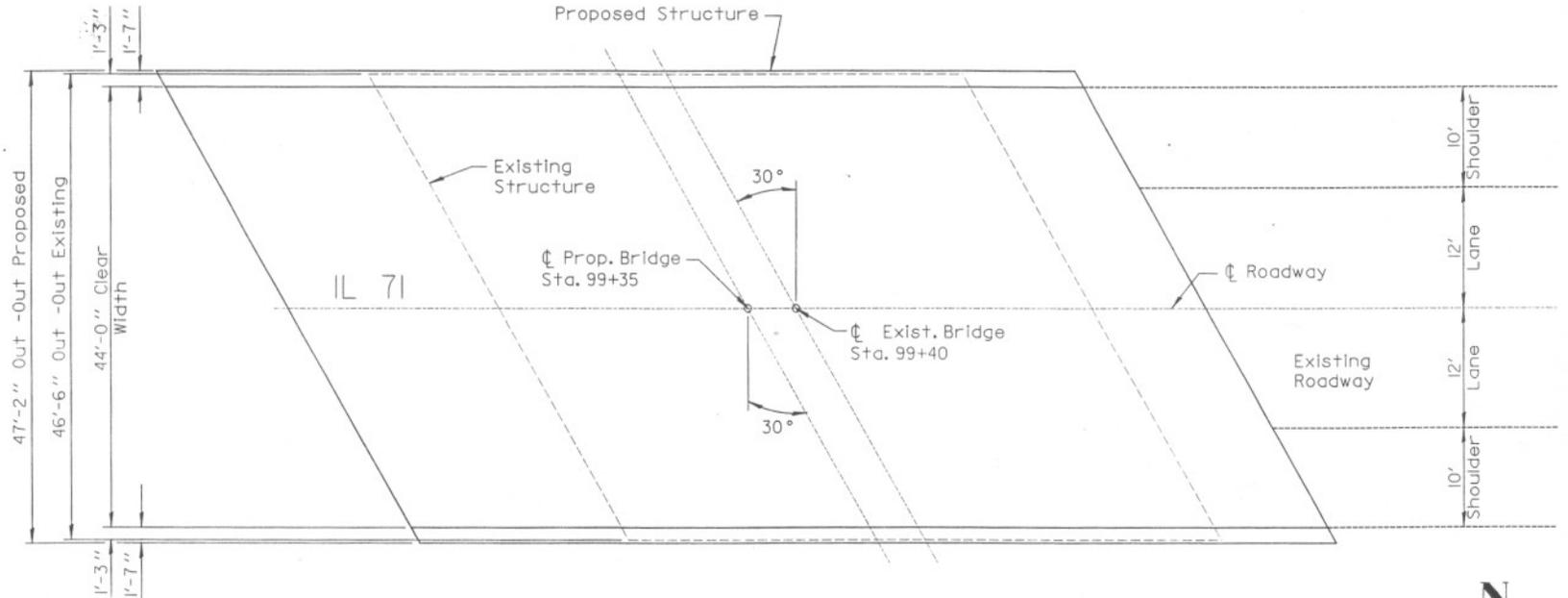
6'-8" BK.-BK. ABUTMENTS



NOTE: () INDICATES STATION ADJUSTED FOR 30° SKEW.

EXISTING
 BRIDGE OPENING
 S.N. 050-0030

F.A.P. ROUTE 627
 S.N. 050-0030
 LASALLE COUNTY
 IL. RTE 71 over STREAM



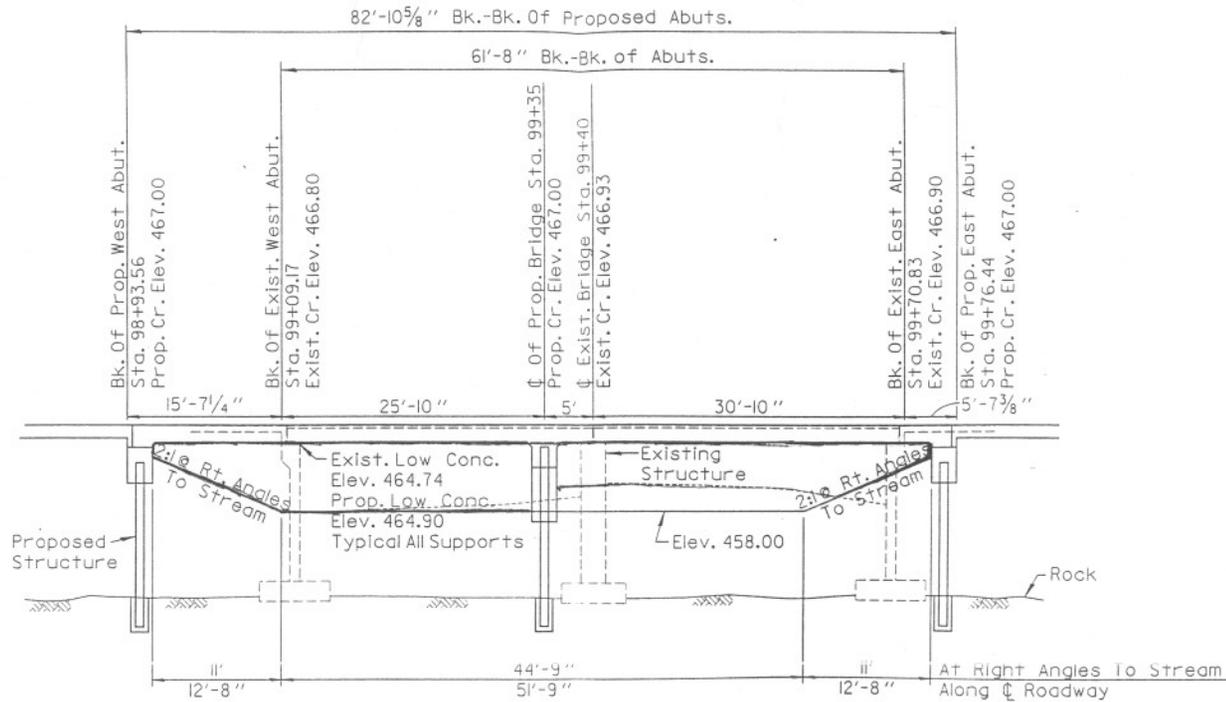
EXISTING & PROPOSED BRIDGE PLAN

Existing Structure:
 A Two-Span (2 @ 29'-6") PPC Deck Beam Bridge On Closed Concrete Abutments And Reinforced Concrete Pier, All On Spread Footings. 46'-6" O.-O. Deck, 6'-8" Bk.-Bk. Abuts., Skewed 30° Right Ahead.

Proposed Structure:
 A Two-Span (2 @ 40'-0") Reinforced Concrete Slab On Spill-Thru, Pile Bent Abutments And Pile Bent Pier, All Piles Set In Rock. 47'-2" O.-O. Deck 82'-10 5/8" Bk.-Bk. Abuts., Skewed 30° Right Ahead.

**EXISTING & PROPOSED
 PLAN VIEW
 S.N. 050-0030**

F.A.P. ROUTE 627
 S.N. 050-0030
 LASALLE COUNTY
 IL. RTE 71 over STREAM



EXISTING AND PROPOSED BRIDGE ELEVATION
 (LOOKING NORTH)

Existing Structure:

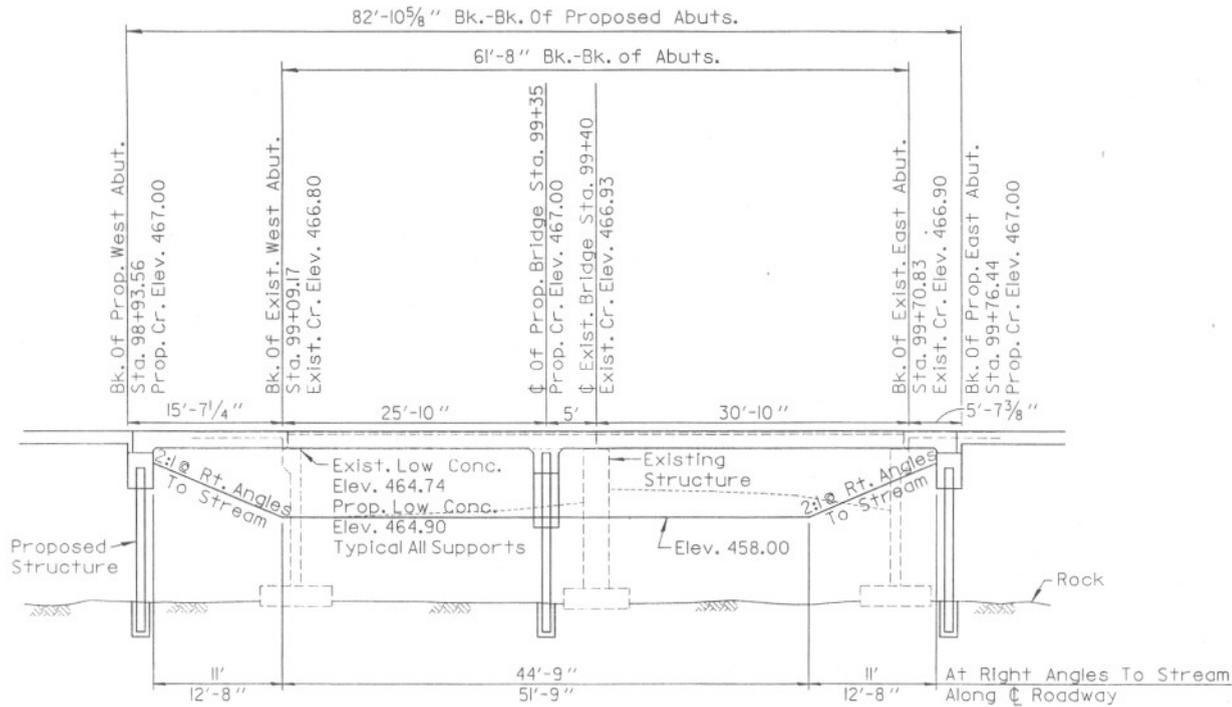
A Two-Span (2 @ 29'-6") PPC Deck Beam Bridge On Closed Concrete Abutments And Reinforced Concrete Pier, All On Spread Footings. 46'-6" O.-O. Deck, 6'-8" Bk.-Bk. Abuts., Skewed 30° Right Ahead.

Proposed Structure:

A Two-Span (2 @ 40'-0") Reinforced Concrete Slab On Spill-Thru, Pile Bent Abutments And Pile Bent Pier, All Piles Set In Rock. 47'-2" O.-O. Deck 82'-10 5/8" Bk.-Bk. Abuts., Skewed 30° Right Ahead.

EXISTING & PROPOSED
 ELEVATION VIEW
 S.N. 050-0030

F.A.P. ROUTE 627
 S.N. 050-0030
 LASALLE COUNTY
 IL. RTE 71 over STREAM



EXISTING AND PROPOSED BRIDGE ELEVATION

(LOOKING NORTH)

Existing Structure:

A Two-Span (2 @ 29'-6") PPC Deck Beam Bridge On Closed Concrete Abutments And Reinforced Concrete Pier, All On Spread Footings, 46'-6" O.-O. Deck, 61'-8" Bk.-Bk. Abuts., Skewed 30° Right Ahead.

Proposed Structure:

A Two-Span (2 @ 40'-0") Reinforced Concrete Slab On Spill-Thru, Pile Bent Abutments And Pile Bent Pier, All Piles Set In Rock, 47'-2" O.-O. Deck 82'-10 5/8" Bk.-Bk. Abuts., Skewed 30° Right Ahead.

EXISTING & PROPOSED
 ELEVATION VIEW
 S.N. 050-0030

F.A.P. ROUTE 627
 S.N. 050-0030
 LASALLE COUNTY
 IL. RTE 71 over STREAM

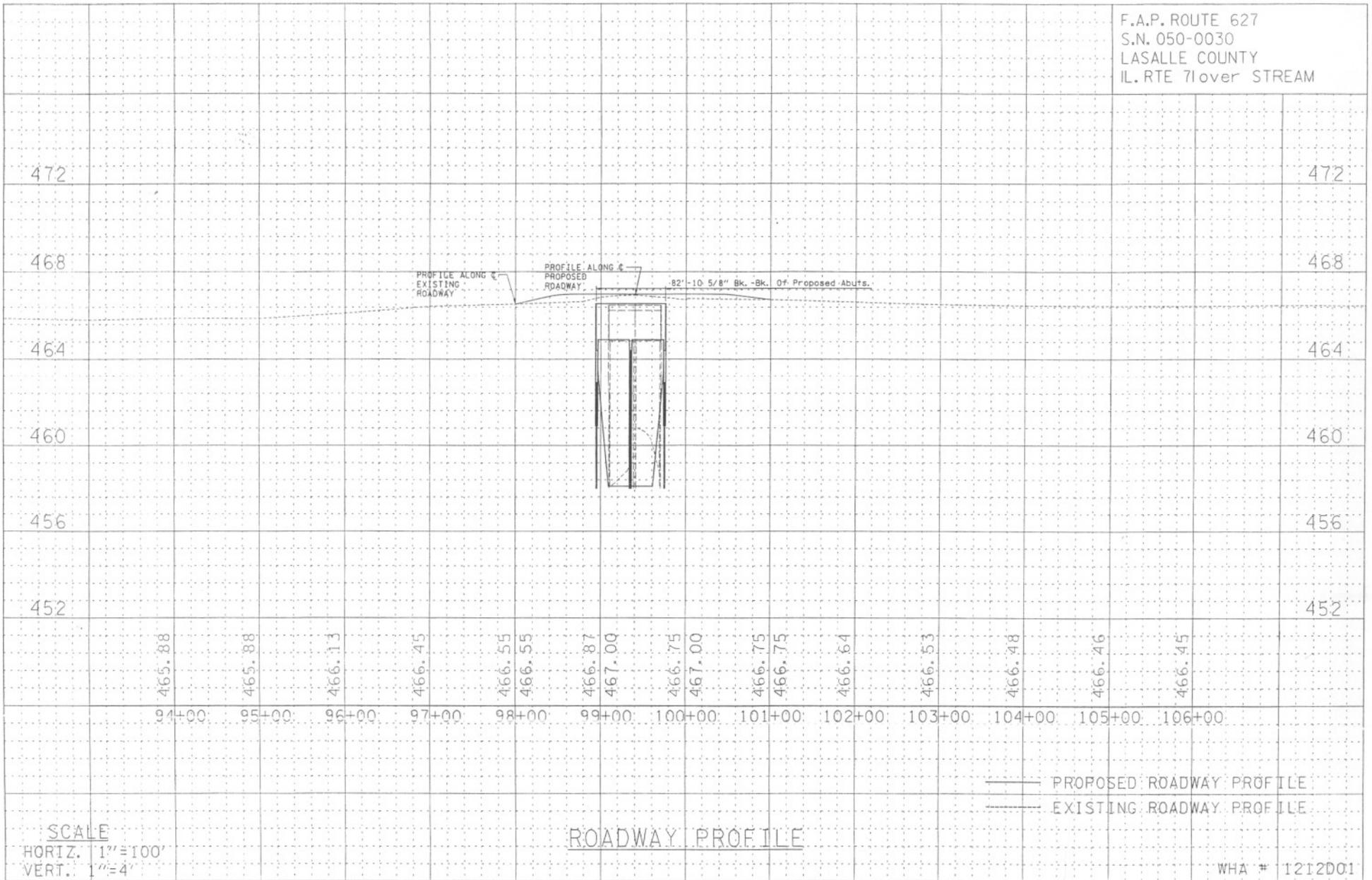
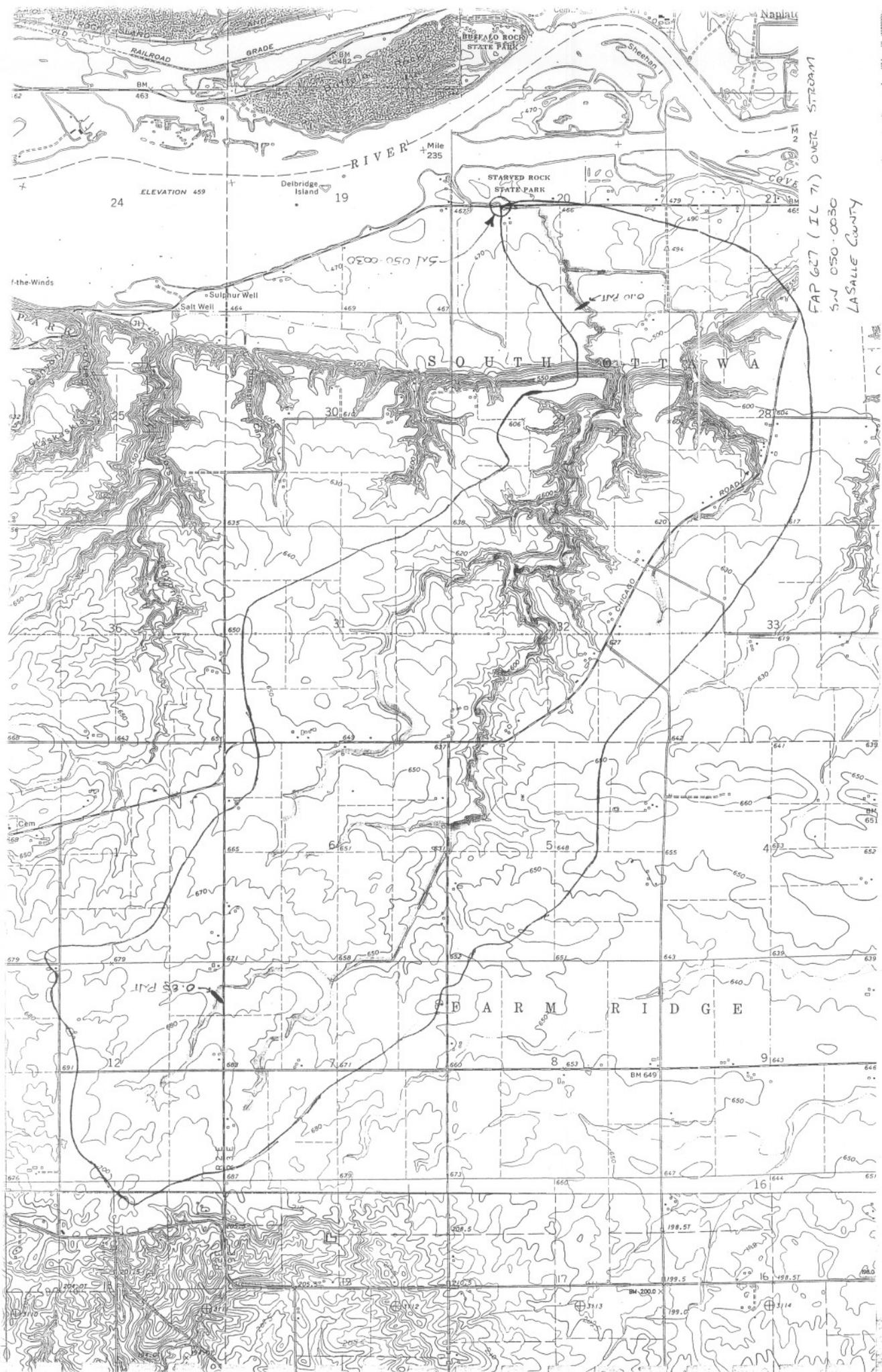


EXHIBIT 1

DRAINAGE AREA



FAP 627 (IL 71) OVER STREAM
 S-N 050-0030
 LASALLE COUNTY

EXHIBIT 2

NATURAL RUN

IL71.rep

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X      X  XXXXXX   XXXX       XXXX       XX       XXXX
X      X  X       X   X       X   X       X   X       X
X      X  X       X       X       X   X       X   X       X
XXXXXXXX XXXX     X       XXX XXXX     XXXXXX     XXXX
X      X  X       X       X       X   X       X   X       X
X      X  X       X   X       X   X       X   X       X
X      X  XXXXXX   XXXX       X   X       X   X       XXXXX
```

PROJECT DATA

Project Title: Illinois Rte. 71 Over Intermittent Stream
Project File : IL71.prj
Run Date and Time: 10/22/2002 2:52:39 PM

Project in English units

Project Description:

Illinois 71 over Intermittent Stream
LaSalle County, IL

PLAN DATA

Plan Title: Unconstricted Flow - Existing Bridge
Plan File : s:\struct\1212D01WO#3IDOTD3\Hydraulics\IL71.p04

Geometry Title: Unconstricted Flow
Geometry File : s:\struct\1212D01WO#3IDOTD3\Hydraulics\IL71.g02

Flow Title : Flow Data - Existing Bridge
Flow File : s:\struct\1212D01WO#3IDOTD3\Hydraulics\IL71.f01

Plan Summary Information:

Number of:	Cross Sections = 9	Multiple Openings = 0
	Culverts = 0	Inline weirs = 0
	Bridges = 0	

Computational Information

water surface calculation tolerance =	0.01
Critical depth calculaton tolerance =	0.01
Maximum number of interations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

FLOW DATA

Flow Title: Flow Data - Existing Bridge

Flow File : s:\struct\1212D01WO#3IDOTD3\Hydraulics\IL71.f01

Flow Data (cfs)

River	100 Yr	Reach	500 Yr	RS	Overtopping	10 Yr	30 Yr	50 Yr
Stream	2420	1	3160	3000	1710	1370	1830	2110

Boundary Conditions

River	Reach	Profile	Upstream	
Downstream				
Stream	1	10 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	30 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	50 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	100 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	500 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	Overtopping	Normal s = .001039	Known
WS = 464.7				

GEOMETRY DATA

Geometry Title: Unconstricted Flow
 Geometry File : s:\struct\1212D01WO#3IDOTD3\Hydraulics\IL71.g02

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 3000

INPUT

Description: 1000' Upstream

Station Elevation Data		num= 10							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
650	470	895	468.7	985	465.9	995	461.3	1000	460.5
1006	461.3	1016	465.5	1115	467.5	1210	467.6	1400	470

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
650	.065	985	.035	1016	.065

Bank Sta: Left 985 Right 1016 Lengths: Left Channel 250 Right Channel 250 Coeff Contr. .1 Expan. .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2750.*

INPUT

Description:

Station Elevation Data		num= 17							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
700	469.25	760.19	468.71	909.53	466.83	986.5	464.7	994.38	460.59
995.5	460.23	1000	459.55	1004.04	460.01	1007.88	461.17	1013.73	463.59
1021	465.65	1118.07	466.22	1126.45	466.3	1227.63	466.31	1250.94	466.44
1325.39	467.58	1430	469.25						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 700 .065 986.5 .035 1021 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 986.5 1021 250 250 250 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2500

INPUT

Description:

Station Elevation Data num= 12
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 750 468.5 800 467.8 988 463.5 995 459.3 1000 458.6
 1005 459.1 1017 464 1026 465.8 1129 465.1 1270 465
 1349 466.4 1460 468.5

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 750 .065 988 .035 1026 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 988 1026 500 415 365 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2100

INPUT

Description: 100' Upstream

Station Elevation Data num= 11
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 365 467.5 557 466.3 787 465.2 989 461.9 991 458.9
 1000 458.1 1008 459 1016 462.5 1066 465 1141 466.7
 1186 468

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 365 .065 989 .035 1016 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 989 1016 225 260 375 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1900

INPUT

Description: 100' Downstream

Station Elevation Data num= 13
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 935 467 941 466.6 978 463.9 981 459.6 991 458.8
 1000 458 1012 458.8 1016 463.8 1112 463.1 1211 462.3
 1261 464.3 1318 467.1 1363 468.5

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 935 .05 978 .035 1016 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 978 1016 190 190 222.94 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1697.33*

INPUT

Description:

Station Elevation Data num= 19
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 945.13 466.39 950.07 466.18 962.83 465.59 980.53 462.43 982.82 459.54
 983.19 459.22 992.04 458.28 1000 457.39 1012.38 458.71 1013.59 459.53

1016.51 463.09 1096.81 462.34 1127.67 462.04 1179.62 462.23 1188.19 462.5
 1221.44 464.59 1245 466.2 1269.12 467.1 1306.76 468.09

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 945.13 .05 980.53 .035 1016.51 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 980.53 1016.51 190 190 222.94 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1500

INPUT

Description: 500' Downstream

Station Elevation Data num= 11
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 955 465.8 969 465.7 983 461 985 458.9 1000 456.8
 1014 458.8 1017 462.4 1107 461.3 1156 462.3 1202 466.7
 1252 467.7

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 955 .05 983 .035 1017 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 983 1017 257.98 250 167.09 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1234.04*

INPUT

Description:

Station Elevation Data num= 18
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 911.91 466.81 943.93 465.91 944.27 465.89 976.62 461.05 979.37 459.37
 981.45 458.75 1000 456.75 1020.13 458.65 1022.08 459.51 1024.45 461.6
 1107.62 460.61 1145.61 460.88 1177.75 461.47 1211.58 461.69 1250.32 462.95
 1273.51 465.23 1300.06 467.15 1340.83 467.7

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 911.91 .05 976.62 .035 1024.45 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 976.62 1024.45 257.98 250 167.09 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1000

INPUT

Description: 1000' Downstream

Station Elevation Data num= 12
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 874 467.7 922 456.1 971 461.1 977 458.8 1000 456.7
 1028 458.7 1031 460.9 1133 459.7 1219 461.2 1308 461.1
 1369 467.2 1419 467.7

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 874 .05 971 .035 1031 .08

Bank Sta: Left Right Coeff Contr. Expan.
 971 1031 .1 .3

SUMMARY OF MANNING'S N VALUES

River:Stream

IL71.rep

Reach	River Sta.	n1	n2	n3
1	3000	.065	.035	.065
1	2750.*	.065	.035	.065
1	2500	.065	.035	.065
1	2100	.065	.035	.065
1	1900	.05	.035	.08
1	1697.33*	.05	.035	.08
1	1500	.05	.035	.08
1	1234.04*	.05	.035	.08
1	1000	.05	.035	.08

SUMMARY OF REACH LENGTHS

River: Stream

Reach	River Sta.	Left	Channel	Right
1	3000	250	250	250
1	2750.*	250	250	250
1	2500	500	415	365
1	2100	225	260	375
1	1900	190	190	222.94
1	1697.33*	190	190	222.94
1	1500	257.98	250	167.09
1	1234.04*	257.98	250	167.09
1	1000			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Stream

Reach	River Sta.	Contr.	Expan.
1	3000	.1	.3
1	2750.*	.1	.3
1	2500	.1	.3
1	2100	.1	.3
1	1900	.1	.3
1	1697.33*	.1	.3
1	1500	.1	.3
1	1234.04*	.1	.3
1	1000	.1	.3

EXHIBIT 3

EXISTING RUN

IL71.rep

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

```
X      X  XXXXXX   XXXX      XXXX      XX      XXXX
X      X  X       X   X      X   X      X   X      X
X      X  X       X       X   X   X      X   X      X
XXXXXXXX XXXX     X       XXX  XXXX     XXXXXX     XXXX
X      X  X       X       X   X   X      X   X      X
X      X  X       X   X      X   X      X   X      X
X      X  XXXXXX   XXXX     X   X      X   X      XXXXXX
```

PROJECT DATA

Project Title: Illinois Rte. 71 Over Intermittent Stream
Project File : IL71.prj
Run Date and Time: 10/22/2002 2:48:47 PM

Project in English units

Project Description:
Illinois 71 over Intermittent Stream
LaSalle County, IL

PLAN DATA

Plan Title: Existing Bridge
Plan File : s:\struct\1212D01W0#3ID0TD3\Hydraulics\IL71.p03

Geometry Title: Existing Bridge
Geometry File : s:\struct\1212D01W0#3ID0TD3\Hydraulics\IL71.g01

Flow Title : Flow Data - Existing Bridge
Flow File : s:\struct\1212D01W0#3ID0TD3\Hydraulics\IL71.f01

Plan Summary Information:

Number of: Cross Sections == 11 Multiple Openings = 0
 Culverts == 0 Inline Weirs = 0
 Bridges == 1

Computational Information

water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: Flow Data - Existing Bridge

Flow File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.f01

Flow Data (cfs)

River	100 Yr	Reach	500 Yr	RS	10 Yr	30 Yr	50 Yr
Stream	2420	1	3160	Overtopping 3000	1370	1830	2110
				1710			

Boundary Conditions

River	Reach	Profile	Upstream	
Downstream				
Stream	1	10 Yr	Normal S = .001039	Known
WS = 464.7				
Stream	1	30 Yr	Normal S = .001039	Known
WS = 464.7				
Stream	1	50 Yr	Normal S = .001039	Known
WS = 464.7				
Stream	1	100 Yr	Normal S = .001039	Known
WS = 464.7				
Stream	1	500 Yr	Normal S = .001039	Known
WS = 464.7				
Stream	1	Overtopping	Normal S = .001039	Known
WS = 464.7				

GEOMETRY DATA

Geometry Title: Existing Bridge
 Geometry File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.g01

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 3000

INPUT

Description: 1000' Upstream

Station Elevation Data		num= 10		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
650	470	895	468.7	985	465.9	995	461.3	1000	460.5
1006	461.3	1016	465.5	1115	467.5	1210	467.6	1400	470

Manning's n Values

num= 3		Sta n Val		Sta n Val	
Sta	n Val	Sta	n Val	Sta	n Val
650	.065	985	.035	1016	.065

Bank Sta: Left 985 Right 1016 Lengths: Left Channel 250 Right 250 Coeff Contr. .1 Expan. .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2750.*

INPUT

Description:

Station Elevation Data		num= 17		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
700	469.25	760.19	468.71	909.53	466.83	986.5	464.7	994.38	460.59
995.5	460.23	1000	459.55	1004.04	460.01	1007.88	461.17	1013.73	463.59
1021	465.65	1118.07	466.22	1126.45	466.3	1227.63	466.31	1250.94	466.44
1325.39	467.58	1430	469.25						

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 700 .065 986.5 .035 1021 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 986.5 1021 250 250 250 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2500

INPUT

Description:

Station Elevation Data num= 12
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 750 468.5 800 467.8 988 463.5 995 459.3 1000 458.6
 1005 459.1 1017 464 1026 465.8 1129 465.1 1270 465
 1349 466.4 1460 468.5

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 750 .065 988 .035 1026 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 988 1026 500 415 365 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2100

INPUT

Description: 100' Upstream

Station Elevation Data num= 11
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 365 467.5 557 466.3 787 465.2 989 461.9 991 458.9
 1000 458.1 1008 459 1016 462.5 1066 465 1141 466.7
 1186 468

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 365 .065 989 .035 1016 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 989 1016 87 105 163 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 888 F
 888 F

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2025

INPUT

Description: 100' Upstream

Station Elevation Data num= 20
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 365 467.5 557 466.3 787 465.2 989 461.9 991.3 457.2
 995.7 458.1 1000 458.3 1004.3 458.5 1008.7 458.7 1014.7 459.4
 1017.3 460.7 1021.7 460.6 1026 460.5 1030.3 460.3 1032.9 460.1
 1040.7 458.7 1046 462.5 1066 465 1141 466.7 1186 468

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 365 .065 989 .035 1046 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 989 1046 50 50 50 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 888 F
 888 F

BRIDGE REACH: 1 RIVER: Stream RS: 2000

INPUT

Description:
 Distance from Upstream XS = 1.75
 Deck/Roadway width = 46.5
 weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 19											
Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord	
150	466.14			250	465.89			350	465.81		
450	465.88			550	465.88			650	466.13		
750	466.45			850	466.55			950	466.87		
991.3	466.9	464.74		1000	466.93	464.74		1040.7	466.8	464.74	
1150	466.75			1250	466.64			1350	466.53		
1450	466.48			1550	466.46			1850	466.47		
1950	466.78										

Upstream Bridge Cross Section Data

Station Elevation Data num= 20											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
365	467.5	557	466.3	787	465.2	989	461.9	991.3	457.2		
995.7	458.1	1000	458.3	1004.3	458.5	1008.7	458.7	1014.7	459.4		
1017.3	460.7	1021.7	460.6	1026	460.5	1030.3	460.3	1032.9	460.1		
1040.7	458.7	1046	462.5	1066	465	1141	466.7	1186	468		

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
365	.065	989	.035	1046	.065

Bank Sta: Left 989 Right 1046 Coeff Contr. .3 Expan. .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent

888 F
 888 F

Downstream Deck/Roadway Coordinates

num= 19											
Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord	
150	466.14			250	465.89			350	465.81		
450	465.88			550	465.88			650	466.13		
750	466.45			850	466.55			950	466.87		
991.3	466.9	464.74		1000	466.93	464.74		1040.7	466.8	464.74	
1150	466.75			1250	466.64			1350	466.53		
1450	466.48			1550	466.46			1850	466.47		
1950	466.78										

Downstream Bridge Cross Section Data

Station Elevation Data num= 23											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
935	467	941	466.6	978	463.9	981	463.7	986	463.5		
990.3	457.2	995.7	458.1	1000	458.3	1004.3	458.5	1008.7	458.7		
1014.7	459.4	1017.3	460.7	1021.7	460.6	1026	460.5	1030.3	460.3		
1032.9	460.1	1041.7	458.7	1045	463	1112	463.1	1211	462.3		
1261	464.3	1318	467.1	1363	468.5						

Manning's n Values

num= 3					
Sta	n Val	Sta	n Val	Sta	n Val
935	.05	986	.035	1045	.08

Bank Sta: Left 986 Right 1045 Coeff Contr. .3 Expan. .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent

888 F
 888 F

Upstream Embankment side slope

= 2 horiz. to 1.0 vertical
 Page 4

Downstream Embankment side slope = 2 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .95
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 weir crest shape = Broad Crested

Number of Piers = 1

Pier Data
 Pier Station Upstream= 1016 Downstream= 1016
 Upstream num= 2
 width Elev width Elev
 2.5 450 2.5 480
 Downstream num= 2
 width Elev width Elev
 2.5 450 2.5 480

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy
 Momentum Cd = 2
 Yarnell KVal = 1.25
 W.S. Pro Method

W.S.Pro Data

Left Embankment
 El of the top of the embankment = 466.93
 El of the toe of the abutment = 457.2
 Right Embankment
 El of the top of the embankment = 466.93
 El of the toe of the abutment = 458.7
 Abtument Type = 4 Vert. abutments and sloping embankments with
 wingwalls
 Slope of abutments =
 Top with of embankment = 46.5
 Centroid station of bridge opening = 1000
 wing wall Type = Angular wing walls
 width = 10
 Angle = 45
 Radius =
 Guide Banks Type = No Guide Bank present
 Length =
 Offset =
 Angle =

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and weir flow
 Submerged Inlet Cd =
 Submerged Inlet + Outlet Cd = .8
 Max Low Cord =

Additional Bridge Parameters

Add Friction component to Momentum
 Do not add weight component to Momentum
 Class B flow critical depth computations use critical depth
 inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION RIVER: Stream
 REACH: 1 R.S: 1975

INPUT

Description: 100' Downstream
 Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
935	467	941	466.6	978	463.9	981	463.7	986	463.5

Sta	Elev								
990.3	457.2	995.7	458.1	1000	458.3	1004.3	458.5	1008.7	458.7
1014.7	459.4	1017.3	460.7	1021.7	460.6	1026	460.5	1030.3	460.3
1032.9	460.1	1041.7	458.7	1045	463	1112	463.1	1211	462.3
1261	464.3	1318	467.1	1363	468.5				

IL71.rep

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 935 .05 986 .035 1045 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 986 1045 88 105 162 .3 .5
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 888 F
 888 F

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1900

INPUT

Description: 100' Downstream
 Station Elevation Data num= 13
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 935 467 941 466.6 978 463.9 981 459.6 991 458.8
 1000 458 1012 458.8 1016 463.8 1112 463.1 1211 462.3
 1261 464.3 1318 467.1 1363 468.5

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 935 .05 978 .035 1016 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 978 1016 190 190 222.94 .3 .5
 Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 888 F
 888 F

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1697.33*

INPUT

Description:
 Station Elevation Data num= 19
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 945.13 466.39 950.07 466.18 962.83 465.59 980.53 462.43 982.82 459.54
 983.19 459.22 992.04 458.28 1000 457.39 1012.38 458.71 1013.59 459.53
 1016.51 463.09 1096.81 462.34 1127.67 462.04 1179.62 462.23 1188.19 462.5
 1221.44 464.59 1245 466.2 1269.12 467.1 1306.76 468.09

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 945.13 .05 980.53 .035 1016.51 .08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 980.53 1016.51 190 190 222.94 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1500

INPUT

Description: 500' Downstream
 Station Elevation Data num= 11
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 955 465.8 969 465.7 983 461 985 458.9 1000 456.8
 1014 458.8 1017 462.4 1107 461.3 1156 462.3 1202 466.7
 1252 467.7

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 Page 6

955 .05 983 .035 1017
 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 983 1017 257.98 250 167.09 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1234.04*

INPUT

Description:
 Station Elevation Data num= 18

Sta	Elev								
911.91	466.81	943.93	455.91	944.27	465.89	976.62	461.05	979.37	459.37
981.45	458.75	1000	456.75	1020.13	458.65	1022.08	459.51	1024.45	461.6
1107.62	460.61	1145.61	460.88	1177.75	461.47	1211.58	461.69	1250.32	462.95
1273.51	465.23	1300.06	457.15	1340.83	467.7				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
911.91	.05	976.62	.035	1024.45	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 976.62 1024.45 257.98 250 167.09 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1000

INPUT

Description: 1000' Downstream
 Station Elevation Data num= 12

Sta	Elev								
874	467.7	922	466.1	971	461.1	977	458.8	1000	456.7
1028	458.7	1031	460.9	1133	459.7	1219	461.2	1308	461.1
1369	467.2	1419	467.7						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
874	.05	971	.035	1031	.08

Bank Sta: Left Right Coeff Contr. Expan.
 971 1031 .1 .3

SUMMARY OF MANNING'S N VALUES

River: Stream

Reach	River Sta.	n1	n2	n3
1	3000	.065	.035	.065
1	2750.*	.065	.035	.065
1	2500	.065	.035	.065
1	2100	.065	.035	.065
1	2025	.065	.035	.065
1	2000	Bridge		
1	1975	.05	.035	.08
1	1900	.05	.035	.08
1	1697.33*	.05	.035	.08
1	1500	.05	.035	.08
1	1234.04*	.05	.035	.08
1	1000	.05	.035	.08

SUMMARY OF REACH LENGTHS

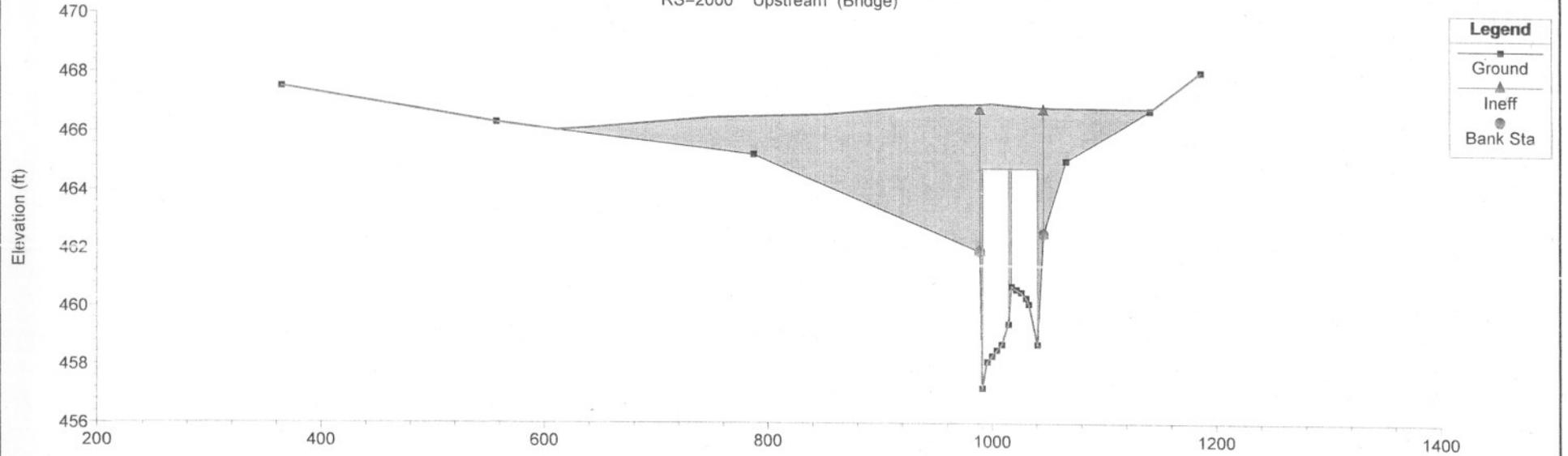
River: Stream

Reach	River Sta.	IL71.rep		Right
		Left	Channel	
1	3000	250	250	250
1	2750.*	250	250	250
1	2500	500	415	365
1	2100	87	105	163
1	2025	50	50	50
1	2000	Bridge		
1	1975	88	105	162
1	1900	190	190	222.94
1	1697.33*	190	190	222.94
1	1500	257.98	250	167.09
1	1234.04*	257.98	250	167.09
1	1000			

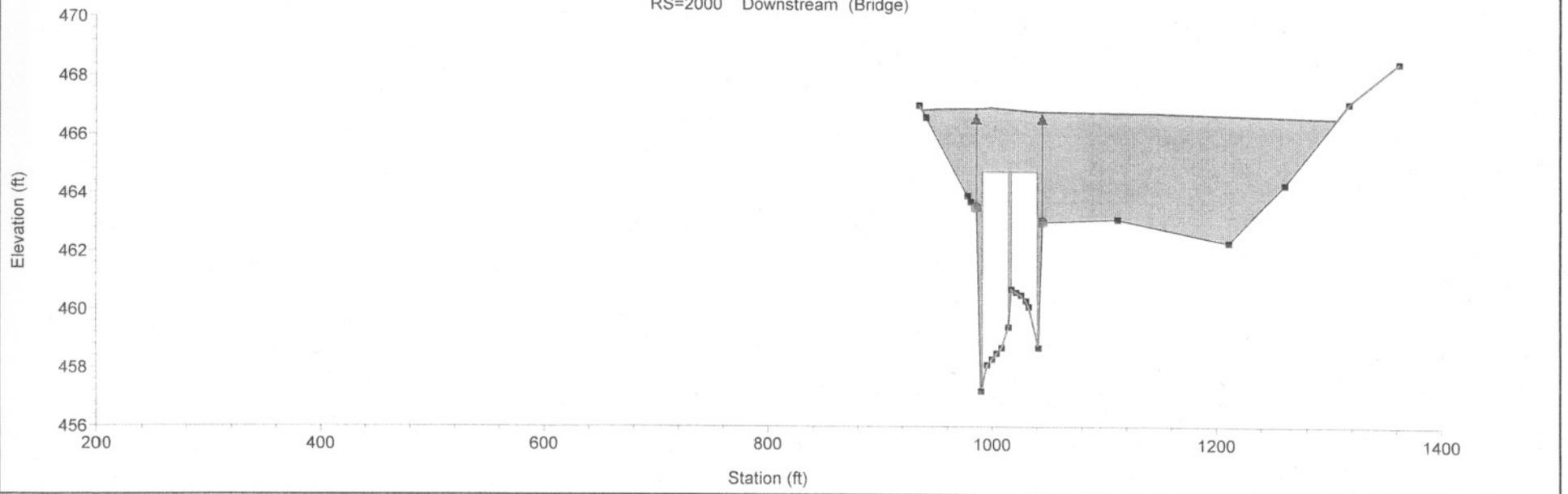
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Stream

Reach	River Sta.	Contr.	Expan.
1	3000	.1	.3
1	2750.*	.1	.3
1	2500	.1	.3
1	2100	.3	.5
1	2025	.3	.5
1	2000	Bridge	
1	1975	.3	.5
1	1900	.3	.5
1	1697.33*	.1	.3
1	1500	.1	.3
1	1234.04*	.1	.3
1	1000	.1	.3

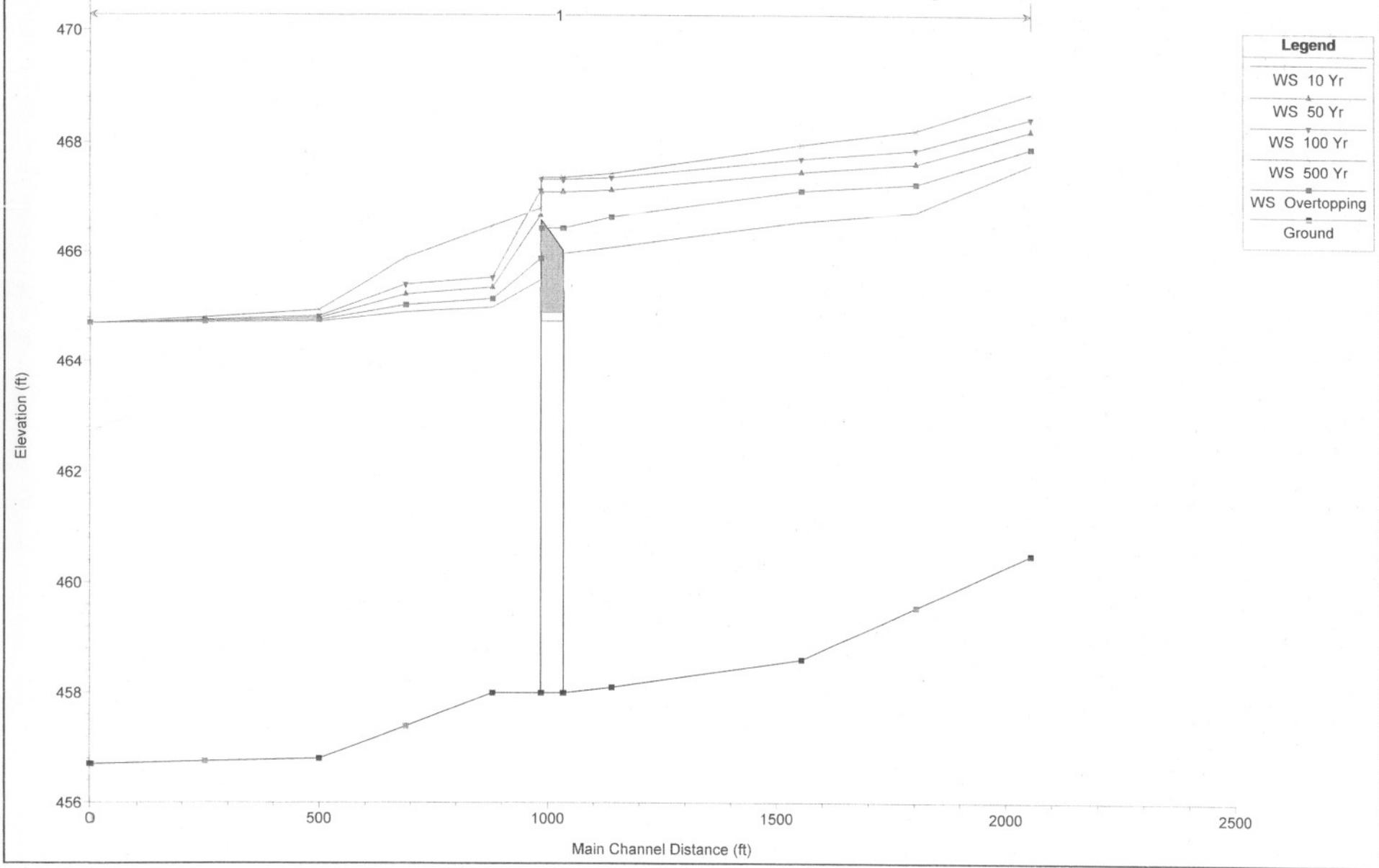
RS=2000 Upstream (Bridge)



RS=2000 Downstream (Bridge)



Illinois Rte. 71 Over Intermittent Stream Plan: 1) Existing



HEC-RAS River: Stream Reach: 1

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	3000	10 Yr	UnconExist	1370.00	460.50	467.65		468.40	0.003855	7.47	331.27	285.73	0.58
1	3000	10 Yr	Existing	1370.00	460.50	467.61	467.01	468.40	0.004081	7.64	317.33	280.25	0.60
1	3000	50 Yr	UnconExist	2110.00	460.50	468.30	468.27	469.14	0.004334	8.59	540.28	358.01	0.63
1	3000	50 Yr	Existing	2110.00	460.50	468.22		469.14	0.004777	8.92	509.93	348.45	0.66
1	3000	100 Yr	UnconExist	2420.00	460.50	468.50	468.50	469.38	0.004603	9.05	610.99	379.36	0.66
1	3000	100 Yr	Existing	2420.00	460.50	468.44		469.38	0.004889	9.26	590.52	373.31	0.67
1	3000	500 Yr	UnconExist	3160.00	460.50	468.90		469.91	0.005210	10.06	777.26	456.05	0.70
1	3000	500 Yr	Existing	3160.00	460.50	468.88		469.91	0.005296	10.12	769.56	451.51	0.71
i	3000	Overtopping	UnconExist	1710.00	460.50	467.99		468.78	0.004056	8.00	434.50	323.46	0.61
1	3000	Overtopping	Existing	1710.00	460.50	467.91		468.78	0.004482	8.32	406.95	313.04	0.61
1	2750.*	10 Yr	UnconExist	1370.00	459.55	466.59		467.36	0.004486	7.53	323.38	342.61	0.62
1	2750.*	10 Yr	Existing	1370.00	459.55	466.73		467.37	0.003751	7.02	370.94	356.41	0.57
1	2750.*	50 Yr	UnconExist	2110.00	459.55	467.28		468.02	0.004413	8.20	585.98	431.34	0.63
1	2750.*	50 Yr	Existing	2110.00	459.55	467.62		468.10	0.002886	6.92	742.34	480.85	0.52
1	2750.*	100 Yr	UnconExist	2420.00	459.55	467.54		468.24	0.004168	8.23	705.94	469.87	0.62
1	2750.*	100 Yr	Existing	2420.00	459.55	467.88		468.34	0.002781	7.00	872.29	517.82	0.51
1	2750.*	500 Yr	UnconExist	3160.00	459.55	468.09		468.70	0.003693	8.26	987.72	548.58	0.59
1	2750.*	500 Yr	Existing	3160.00	459.55	468.23		468.75	0.003184	7.78	1061.30	567.32	0.55
1	2750.*	Overtopping	UnconExist	1710.00	459.55	466.91		467.70	0.004624	8.00	437.04	378.06	0.64
1	2750.*	Overtopping	Existing	1710.00	459.55	467.25		467.76	0.003009	6.74	573.23	427.03	0.52
1	2500	10 Yr	UnconExist	1370.00	458.60	466.13		466.43	0.002315	5.36	580.66	460.68	0.44
1	2500	10 Yr	Existing	1370.00	458.60	466.55		466.72	0.001278	4.22	782.79	502.18	0.34
1	2500	50 Yr	UnconExist	2110.00	458.60	466.98		467.20	0.001752	5.22	1005.61	543.34	0.40
1	2500	50 Yr	Existing	2110.00	458.60	467.47		467.60	0.000994	4.17	1283.85	590.74	0.30
1	2500	100 Yr	UnconExist	2420.00	458.60	467.25		467.47	0.001666	5.27	1158.42	569.86	0.39
1	2500	100 Yr	Existing	2420.00	458.60	467.71		467.84	0.001008	4.32	1431.57	614.41	0.31
1	2500	500 Yr	UnconExist	3160.00	458.60	467.79		468.00	0.001579	5.45	1482.87	622.42	0.39
1	2500	500 Yr	Existing	3160.00	458.60	467.97		468.15	0.001334	5.11	1593.21	643.92	0.36
1	2500	Overtopping	UnconExist	1710.00	458.60	466.55		466.81	0.001978	5.26	785.26	502.65	0.42
1	2500	Overtopping	Existing	1710.00	458.60	467.12		467.25	0.000967	3.95	1085.20	557.31	0.30
1	2100	10 Yr	UnconExist	1370.00	458.10	465.37		465.63	0.001498	5.15	618.45	331.24	0.37
1	2100	10 Yr	Existing	1370.00	458.10	466.08	463.85	466.26	0.000906	4.31	592.40	510.85	0.29
1	2100	50 Yr	UnconExist	2110.00	458.10	466.03		466.39	0.002000	6.38	891.29	497.89	0.43
1	2100	50 Yr	Existing	2110.00	458.10	467.13	464.63	467.24	0.000668	4.08	1573.88	731.47	0.26
1	2100	100 Yr	UnconExist	2420.00	458.10	466.31		466.67	0.002005	6.56	1041.55	568.64	0.44

BACKWATER @ River Station 2100

10 YR 466.08 - 465.37 = 0.71'
 50 YR 467.13 - 466.03 = 1.10'
 100 YR 467.36 - 466.31 = 1.05'

500 YR 467.44 - 467.00 = 0.44'
 OVERTOPPING 466.64 - 465.67 = 0.97'

HEC-RAS River: Stream Reach: 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	2100	100 Yr	Existing	2420.00	458.10	467.36	464.87	467.48	0.000703	4.26	1748.67	776.59	0.27
1	2100	500 Yr	UnconExist	3160.00	458.10	467.00		467.29	0.001709	6.45	1477.91	705.48	0.41
1	2100	500 Yr	Existing	3160.00	458.10	467.44	465.50	467.62	0.001115	5.41	1808.01	791.31	0.33
1	2100	Overtopping	UnconExist	1710.00	458.10	465.67		466.00	0.001825	5.87	728.66	406.85	0.41
1	2100	Overtopping	Existing	1710.00	458.10	466.64	464.24	466.83	0.000932	4.61	705.86	635.35	0.30
1	2025	10 Yr	Existing	1370.00	457.20	465.97	462.04	466.19	0.000686	3.68	372.15	483.23	0.25
1	2025	50 Yr	Existing	2110.00	457.20	467.09	462.94	467.18	0.000361	2.97	1673.63	724.46	0.19
1	2025	100 Yr	Existing	2420.00	457.20	467.33	463.27	467.43	0.000393	3.16	1850.01	770.39	0.20
1	2025	500 Yr	Existing	3160.00	457.20	467.37	464.01	467.52	0.000651	4.08	1878.00	777.43	0.26
1	2025	Overtopping	Existing	1710.00	457.20	466.43	462.47	466.72	0.000852	4.29	398.19	592.61	0.29
1	1975	10 Yr	Existing	1370.00	457.20	465.50	461.96	465.73	0.000843	3.84	357.01	329.33	0.27
1	1975	50 Yr	Existing	2110.00	457.20	466.67	462.84	466.76	0.000431	3.09	1363.18	369.23	0.20
1	1975	100 Yr	Existing	2420.00	457.20	467.12	463.17	467.22	0.000424	3.19	1534.92	383.76	0.20
1	1975	500 Yr	Existing	3160.00	457.20	466.80	463.90	467.00	0.000890	4.49	1410.41	373.73	0.29
1	1975	Overtopping	Existing	1710.00	457.20	465.88	462.36	466.20	0.001071	4.50	379.58	342.36	0.31
1	1900	10 Yr	UnconExist	1370.00	458.00	465.09		465.27	0.001022	4.10	723.99	315.37	0.30
1	1900	10 Yr	Existing	1370.00	458.00	465.00	462.50	465.51	0.002146	5.88	286.61	312.21	0.43
1	1900	50 Yr	UnconExist	2110.00	458.00	465.60		465.88	0.001539	5.32	888.09	332.62	0.37
1	1900	50 Yr	Existing	2110.00	458.00	465.36	464.05	466.38	0.003994	8.36	319.30	324.71	0.59
1	1900	100 Yr	UnconExist	2420.00	458.00	465.84		466.14	0.001654	5.65	969.21	340.83	0.39
1	1900	100 Yr	Existing	2420.00	458.00	465.54	464.59	466.77	0.004691	9.23	335.20	330.80	0.64
1	1900	500 Yr	UnconExist	3160.00	458.00	466.45		466.78	0.001754	6.17	1183.22	361.58	0.40
1	1900	500 Yr	Existing	3160.00	458.00	466.47	465.43	466.80	0.001722	6.12	1192.38	362.44	0.40
1	1900	Overtopping	UnconExist	1710.00	458.00	465.31		465.54	0.001299	4.74	794.48	322.89	0.34
1	1900	Overtopping	Existing	1710.00	458.00	465.15	463.10	465.89	0.003013	7.09	300.42	317.49	0.51
1	1697.33*	10 Yr	UnconExist	1370.00	457.39	464.91		465.08	0.000892	4.03	713.20	259.43	0.28
1	1697.33*	10 Yr	Existing	1370.00	457.39	464.91		465.08	0.000892	4.03	713.20	259.43	0.28
1	1697.33*	50 Yr	UnconExist	2110.00	457.39	465.23		465.55	0.001629	5.63	797.98	265.96	0.39
1	1697.33*	50 Yr	Existing	2110.00	457.39	465.23		465.55	0.001629	5.63	798.03	265.97	0.39
1	1697.33*	100 Yr	UnconExist	2420.00	457.39	465.40		465.78	0.001874	6.14	844.24	269.46	0.42
1	1697.33*	100 Yr	Existing	2420.00	457.39	465.41		465.78	0.001862	6.13	846.53	269.63	0.42
1	1697.33*	500 Yr	UnconExist	3160.00	457.39	465.90		466.36	0.002237	7.04	980.56	284.38	0.46
1	1697.33*	500 Yr	Existing	3160.00	457.39	465.90		466.36	0.002238	7.04	980.26	284.34	0.46
1	1697.33*	Overtopping	UnconExist	1710.00	457.39	465.04		465.28	0.001250	4.83	746.68	262.03	0.34

HEC-RAS River: Stream Reach: 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	1697.33*	Overtopping	Existing	1710.00	457.39	465.04		465.28	0.001251	4.83	746.44	262.01	0.34
1	1500	10 Yr	UnconExist	1370.00	456.80	464.73		464.91	0.000830	4.05	677.15	209.56	0.28
1	1500	10 Yr	Existing	1370.00	456.80	464.73		464.91	0.000830	4.05	677.15	209.56	0.28
1	1500	50 Yr	UnconExist	2110.00	456.80	464.80		465.19	0.001874	6.13	691.23	210.46	0.42
1	1500	50 Yr	Existing	2110.00	456.80	464.80		465.19	0.001874	6.13	691.23	210.46	0.42
1	1500	100 Yr	UnconExist	2420.00	456.80	464.82		465.33	0.002433	7.00	694.95	210.69	0.48
1	1500	100 Yr	Existing	2420.00	456.80	464.83		465.34	0.002407	6.97	698.09	210.89	0.48
1	1500	500 Yr	UnconExist	3160.00	456.80	464.95		465.75	0.003770	8.82	722.94	212.47	0.60
1	1500	500 Yr	Existing	3160.00	456.80	464.95		465.75	0.003779	8.83	722.22	212.42	0.60
1	1500	Overtopping	UnconExist	1710.00	456.80	464.76		465.03	0.001266	5.02	683.14	209.94	0.35
1	1500	Overtopping	Existing	1710.00	456.80	464.76		465.03	0.001267	5.02	682.91	209.92	0.35
1	1234.04*	10 Yr	UnconExist	1370.00	456.75	464.71		464.77	0.000298	2.52	1139.13	316.11	0.17
1	1234.04*	10 Yr	Existing	1370.00	456.75	464.71		464.77	0.000298	2.52	1139.13	316.11	0.17
1	1234.04*	50 Yr	UnconExist	2110.00	456.75	464.75		464.89	0.000689	3.84	1150.90	316.74	0.26
1	1234.04*	50 Yr	Existing	2110.00	456.75	464.75		464.89	0.000691	3.84	1149.70	316.67	0.26
1	1234.04*	100 Yr	UnconExist	2420.00	456.75	464.75		464.93	0.000906	4.40	1150.90	316.74	0.30
1	1234.04*	100 Yr	Existing	2420.00	456.75	464.76		464.94	0.000899	4.39	1154.42	316.93	0.30
1	1234.04*	500 Yr	UnconExist	3160.00	456.75	464.81		465.11	0.001480	5.66	1170.05	317.76	0.39
1	1234.04*	500 Yr	Existing	3160.00	456.75	464.81		465.11	0.001485	5.67	1168.72	317.69	0.39
1	1234.04*	Overtopping	UnconExist	1710.00	456.75	464.73		464.82	0.000459	3.13	1144.81	316.41	0.21
1	1234.04*	Overtopping	Existing	1710.00	456.75	464.73		464.82	0.000459	3.13	1144.64	316.40	0.21
1	1000	10 Yr	UnconExist	1370.00	456.70	464.70	460.76	464.73	0.000139	1.75	1657.61	408.28	0.12
1	1000	10 Yr	Existing	1370.00	456.70	464.70	460.76	464.73	0.000139	1.75	1657.61	408.28	0.12
1	1000	50 Yr	UnconExist	2110.00	456.70	464.70	461.60	464.76	0.000331	2.69	1657.61	408.28	0.18
1	1000	50 Yr	Existing	2110.00	456.70	464.70	461.60	464.76	0.000331	2.69	1657.61	408.28	0.18
1	1000	100 Yr	UnconExist	2420.00	456.70	464.70	461.76	464.78	0.000435	3.09	1657.61	408.28	0.21
1	1000	100 Yr	Existing	2420.00	456.70	464.70	461.76	464.78	0.000435	3.09	1657.61	408.28	0.21
1	1000	500 Yr	UnconExist	3160.00	456.70	464.70	462.15	464.84	0.000742	4.03	1657.61	408.28	0.28
1	1000	500 Yr	Existing	3160.00	456.70	464.70	462.15	464.84	0.000742	4.03	1657.61	408.28	0.28
1	1000	Overtopping	UnconExist	1710.00	456.70	464.70	461.06	464.74	0.000217	2.18	1657.61	408.28	0.15
1	1000	Overtopping	Existing	1710.00	456.70	464.70	461.06	464.74	0.000217	2.18	1657.61	408.28	0.15

HEC-RAS Plan: Existing River: Stream Reach: 1

Reach	River Sta	Profile	E.G. US. (ft)	Min El Prs (ft)	BR Open Area (sq ft)	Prs O WS (ft)	Q Total (cfs)	Min El Weir Flow (ft)	Q Weir (cfs)	Delta EG (ft)	BR Open Vel (ft/s)	Wr Flw Area (sq ft)
1	2000	10 Yr	466.19	464.74	257.42	465.97	1370.00	466.71		0.46	5.32	
1	2000	50 Yr	467.18	464.74	257.42		2110.00	466.71	924.77	0.42	4.60	434.68
1	2000	100 Yr	467.43	464.74	257.42		2420.00	466.71	1507.26	0.20	3.55	621.15
1	2000	500 Yr	467.52	464.74	257.42		3160.00	466.71	1759.40	0.52	5.44	699.54
1	2000	Overtopping	466.72	464.74	257.42		1710.00	466.71	213.69	0.52	5.86	136.14

EXHIBIT 4

PROPOSED RUN

IL71.rep

HEC-RAS Version 3.0.1 Mar 2001
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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X   X  XXXXXX   XXXX   XXXX   XX   XXXX
X   X  X       X   X   X   X   X   X
X   X  X       X       X   X   X   X
XXXXXXXX XXXX   X       XXX XXXX XXXXXX XXXX
X   X  X       X       X   X   X   X   X
X   X  X       X   X   X   X   X   X
X   X  XXXXXX   XXXX   X   X   X   X   XXXXX
```

PROJECT DATA

Project Title: Illinois Rte. 71 Over Intermittent Stream
Project File : IL71.prj
Run Date and Time: 10/22/2002 3:08:51 PM

Project in English units

Project Description:

Illinois 71 over Intermittent Stream
LaSalle County, IL

PLAN DATA

Plan Title: Proposed Bridge - Spill-Thru Abut
Plan File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.p06

Geometry Title: Proposed Bridge - Spill-ATHru Abut
Geometry File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.g04

Flow Title : Flow Data - Proposed Bridge
Flow File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.f03

Plan Summary Information:

Number of:	Cross Sections =	11	Multiple Openings =	0
	Culverts =	0	Inline weirs =	0
	Bridges =	1		

Computational Information

water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary	
Conveyance Calculation Method:	At breaks in n values only
Friction Slope Method:	Average Conveyance
Computational Flow Regime:	Subcritical Flow

FLOW DATA

Flow Title: Flow Data - Proposed Bridge

Flow File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.f03

Flow Data (cfs)

River	100 Yr	Reach	500 Yr	RS	10 Yr	30 Yr	50 Yr
Stream	2420	1	3160	Overtopping 3000	1370	1830	2110
				1935			

Boundary Conditions

River	Reach	Profile	Upstream	
Downstream				
Stream	1	10 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	30 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	50 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	100 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	500 Yr	Normal s = .001039	Known
WS = 464.7				
Stream	1	Overtopping	Normal s = .001039	Known
WS = 464.7				

GEOMETRY DATA

Geometry Title: Proposed Bridge - Spill-ATHru Abut
 Geometry File : s:\struct\1212D01W0#3IDOTD3\Hydraulics\IL71.g04

CROSS SECTION REACH: 1 RIVER: Stream RS: 3000

INPUT

Description: 1000' Upstream

Station Elevation Data		num= 10		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
650	470	895	468.7	985	465.9	995	461.3	1000	460.5		
1006	461.3	1016	465.5	1115	467.5	1210	467.6	1400	470		

Manning's n Values

num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val
650	.065	985	.035	1016	.065

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	985	1016		250	250		.1	.3

CROSS SECTION REACH: 1 RIVER: Stream RS: 2750.*

INPUT

Description:

Station Elevation Data		num= 17		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
700	469.25	760.19	468.71	909.53	466.83	986.5	464.7	994.38	460.59		
995.5	460.23	1000	459.55	1004.04	460.01	1007.88	461.17	1013.73	463.59		
1021	465.65	1118.07	466.22	1126.45	466.3	1227.63	466.31	1250.94	466.44		
1325.39	467.58	1430	469.25								

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 700 .065 986.5 .035 1021 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 986.5 1021 250 250 250 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2500

INPUT

Description:

Station Elevation Data num= 12
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 750 468.5 800 467.8 988 463.5 995 459.3 1000 458.6
 1005 459.1 1017 464 1026 465.8 1129 465.1 1270 465
 1349 466.4 1460 468.5

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 750 .065 988 .035 1026 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 988 1026 500 415 365 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2100

INPUT

Description: 100' Upstream

Station Elevation Data num= 11
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 365 467.5 557 466.3 787 465.2 989 461.9 991 458.9
 1000 458.1 1008 459 1016 462.5 1066 465 1141 466.7
 1186 468

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 365 .065 989 .035 1016 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 989 1016 87 105 163 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 888 F
 888 F

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 2025

INPUT

Description: 100' Upstream

Station Elevation Data num= 10
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev
 365 467.5 557 466.3 787 465.2 982.6 463.5 993.6 458
 1038.4 458 1049.4 463.5 1066 465 1141 466.7 1186 468

Manning's n Values num= 3
 Sta n Val Sta n Val Sta n Val
 365 .065 982.6 .035 1049.4 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 982.6 1049.4 50 50 50 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent
 888 F
 888 F

BRIDGE RIVER: Stream
 REACH: 1 RS: 2000

INPUT

Description:

Distance from Upstream XS = 1.75
 Deck/Roadway width = 47.167
 weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 19											
Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord	
150	466.14			250	465.89			350	465.81		
450	465.88			550	465.88			650	466.13		
750	466.45			850	466.55			950	466.87		
982.6	466.9	464.9		1000	466.93	464.9		1049.4	466.8	464.9	
1150	466.75			1250	466.64			1350	466.53		
1450	466.48			1550	466.46			1850	466.47		
1950	466.78										

Upstream Bridge Cross Section Data

Station Elevation Data num= 10											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
365	467.5	557	466.3	787	465.2	982.6	463.5	993.6	458		
1038.4	458	1049.4	463.5	1066	465	1141	466.7	1186	468		

Manning's n Values num= 3							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
365	.065	982.6	.035	1049.4	.065		

Bank Sta: Left Right Coeff Contr. Expan.
 982.6 1049.4 .3 .5

Ineffective Flow num= 2							
Sta L	Sta R	Elev	Permanent	Sta L	Sta R	Elev	Permanent
888	F						
888	F						

Downstream Deck/Roadway Coordinates

num= 19											
Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord		Sta	Hi Cord	Lo Cord	
150	466.14			250	465.89			350	465.81		
450	465.88			550	465.88			650	466.13		
750	466.45			850	466.55			950	466.87		
982.6	466.9	464.9		1000	466.93	464.9		1049.4	466.8	464.9	
1150	466.75			1250	466.64			1350	466.53		
1450	466.48			1550	466.46			1850	466.47		
1950	466.78										

Downstream Bridge Cross Section Data

Station Elevation Data num= 13											
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
935	467	941	466.6	978	463.9	981	463.7	982.6	463.5		
993.6	458	1038.4	458	1049.5	463.5	1112	463.1	1211	462.3		
1261	464.3	1318	467.1	1363	468.5						

Manning's n Values num= 3							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
935	.05	982.6	.035	1049.5	.08		

Bank Sta: Left Right Coeff Contr. Expan.
 982.6 1049.5 .3 .5

Ineffective Flow num= 2							
Sta L	Sta R	Elev	Permanent	Sta L	Sta R	Elev	Permanent
888	F						
888	F						

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
 Downstream Embankment side slope = 2 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .95
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 weir crest shape = Broad Crested

Number of Abutments = 2

Abutment Data

Upstream	num=	2	
Sta	Elev	Sta	Elev
982.6	463.5	993.6	458
Downstream	num=	2	
Sta	Elev	Sta	Elev
982.6	463.5	993.6	458

Abutment Data

Upstream	num=	2	
Sta	Elev	Sta	Elev
1038.4	458	1049.4	463.5
Downstream	num=	2	
Sta	Elev	Sta	Elev
1038.4	458	1049.4	463.5

Number of Piers = 1

Pier Data

Pier Station	Upstream=	1016	Downstream=	1016
Upstream	num=	2		
width	Elev	width	Elev	
2.5	450	2.5	480	
Downstream	num=	2		
width	Elev	width	Elev	
2.5	450	2.5	480	

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data

Energy	
Momentum	Cd = 2
Yarnell	KVal = 1.25
W.S. Pro Method	

W.S.Pro Data

Left Embankment	
El of the top of the embankment	= 466.93
El of the toe of the abutment	= 458
Right Embankment	
El of the top of the embankment	= 466.93
El of the toe of the abutment	= 458
Abtument Type	= 3 Sloping abutments and sloping embankments
Slope of abutments	= 2
Top with of embankment	= 46.5
Centroid station of bridge opening	= 1000
Wing wall Type	= No wing walls present
width	= 10
Angle	= 45
Radius	=
Guide Banks Type	= No Guide Bank present
Length	=
Offset	=
Angle	=

Selected Low Flow Methods = Highest Energy Answer

High Flow Method

Pressure and weir flow	
Submerged Inlet Cd	=
Submerged Inlet + Outlet Cd	= .8
Max Low Cord	=

Additional Bridge Parameters

Add Friction component to Momentum	
Do not add weight component to Momentum	
Class B flow critical depth computations use critical depth	

inside the bridge at the upstream end
 Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1975

INPUT

Description: 100' Downstream
 Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
935	467	941	466.6	978	463.9	981	463.7	982.6	463.5
993.6	458	1038.4	458	1049.5	463.5	1112	463.1	1211	462.3
1261	464.3	1318	467.1	1363	468.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
935	.05	982.6	.035	1049.5	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 982.6 1049.5 88 105 162 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent

888 F
 888 F

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1900

INPUT

Description: 100' Downstream
 Station Elevation Data num= 13

Sta	Elev								
935	467	941	466.6	978	463.9	981	459.6	991	458.8
1000	458	1012	458.8	1016	463.8	1112	463.1	1211	462.3
1261	464.3	1318	467.1	1363	468.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
935	.05	978	.035	1016	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 978 1016 190 190 222.94 .3 .5

Ineffective Flow num= 2
 Sta L Sta R Elev Permanent

888 F
 888 F

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1697.33*

INPUT

Description:
 Station Elevation Data num= 19

Sta	Elev	Sta	Elev								
945.13	466.39	950.07	466.18	962.83	465.59	980.53	462.43	982.82	459.54		
983.19	459.22	992.04	458.28	1000	457.39	1012.38	458.71	1013.59	459.53		
1016.51	463.09	1096.81	462.34	1127.67	462.04	1179.62	462.23	1188.19	462.5		
1221.44	464.59	1245	466.2	1269.12	467.1	1306.76	468.09				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
945.13	.05	980.53	.035	1016.51	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
 980.53 1016.51 190 190 222.94 .1 .3

CROSS SECTION RIVER: Stream
 REACH: 1 RS: 1500

INPUT

Description: 500' Downstream

Station	Elevation	Data	num=	11	Sta	Elev	Sta	Elev	Sta	Elev
955	465.8	969	465.7	983	461	985	458.9	1000	456.8	
1014	458.8	1017	462.4	1107	461.3	1156	462.3	1202	466.7	
1252	467.7									

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
955	.05	983	.035	1017	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	983	1017	257.98	250	167.09		.1	.3

CROSS SECTION REACH: 1

RIVER: Stream RS: 1234.04*

INPUT

Description:

Station	Elevation	Data	num=	18	Sta	Elev	Sta	Elev	Sta	Elev
911.91	466.81	943.93	465.91	944.27	465.89	976.62	461.05	979.37	459.37	
981.45	458.75	1000	456.75	1020.13	458.65	1022.08	459.51	1024.45	461.6	
1107.62	460.61	1145.61	460.88	1177.75	461.47	1211.58	461.69	1250.32	462.95	
1273.51	465.23	1300.06	467.15	1340.83	467.7					

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
911.91	.05	976.62	.035	1024.45	.08

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	976.62	1024.45	257.98	250	167.09		.1	.3

CROSS SECTION REACH: 1

RIVER: Stream RS: 1000

INPUT

Description: 1000' Downstream

Station	Elevation	Data	num=	12	Sta	Elev	Sta	Elev	Sta	Elev
874	467.7	922	466.1	971	461.1	977	458.8	1000	456.7	
1028	458.7	1031	460.9	1133	459.7	1219	461.2	1308	461.1	
1369	467.2	1419	467.7							

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
874	.05	971	.035	1031	.08

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
	971	1031		.1	.3

SUMMARY OF MANNING'S N VALUES

River:Stream

Reach	River Sta.	n1	n2	n3
1	3000	.065	.035	.065
1	2750.*	.065	.035	.065
1	2500	.065	.035	.065
1	2100	.065	.035	.065
1	2025	.065	.035	.065
1	2000			
1	1975	.05	.035	.08
1	1900	.05	.035	.08
1	1697.33*	.05	.035	.08
1	1500	.05	.035	.08
1	1234.04*	.05	.035	.08

1 1000

SUMMARY OF REACH LENGTHS

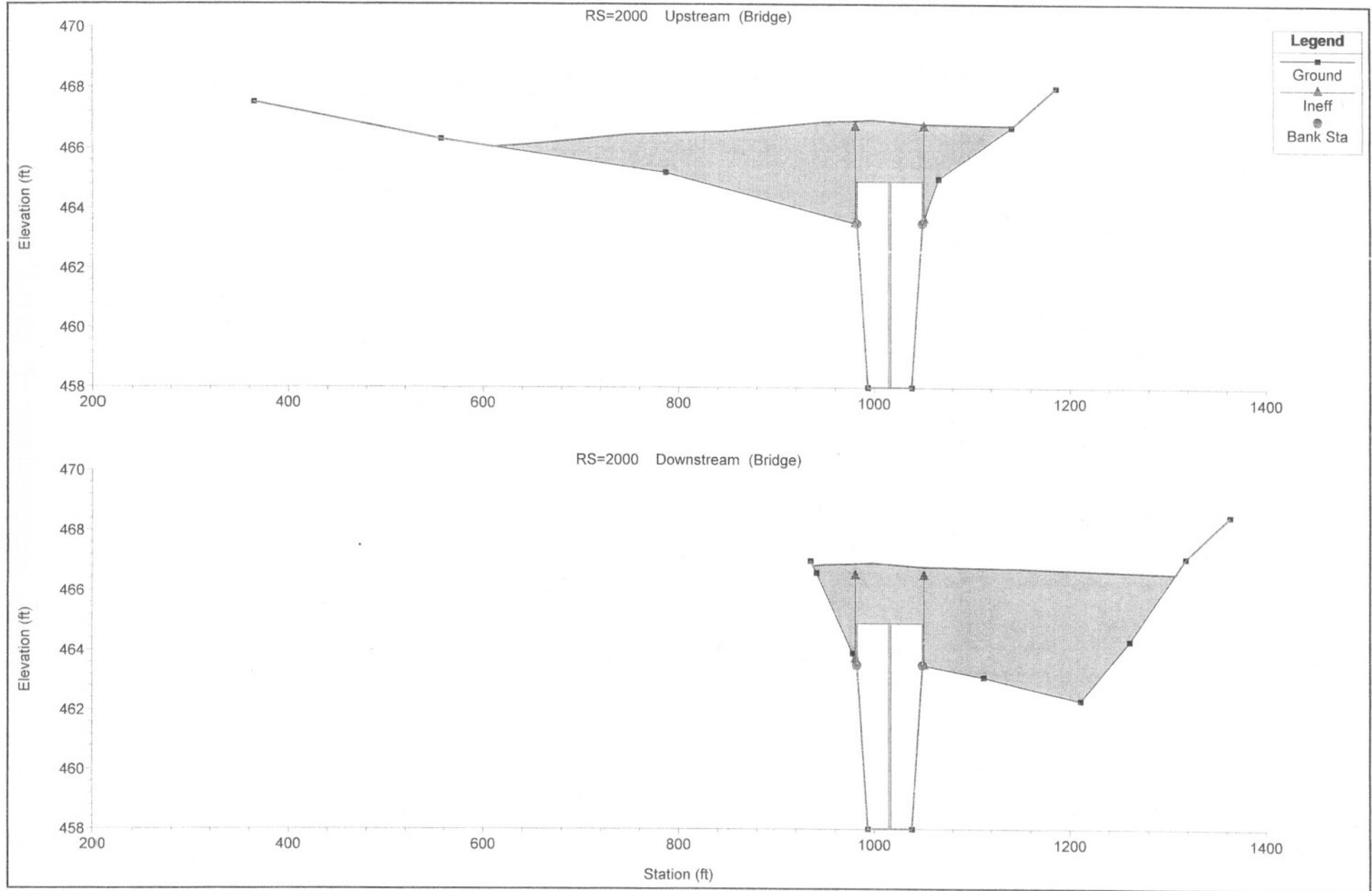
River: Stream

Reach	River Sta.	Left	Channel	Right
1	3000	250	250	250
1	2750.*	250	250	250
1	2500	500	415	365
1	2100	87	105	163
1	2025	50	50	50
1	2000	Bridge		
1	1975	88	105	162
1	1900	190	190	222.94
1	1697.33*	190	190	222.94
1	1500	257.98	250	167.09
1	1234.04*	257.98	250	167.09
1	1000			

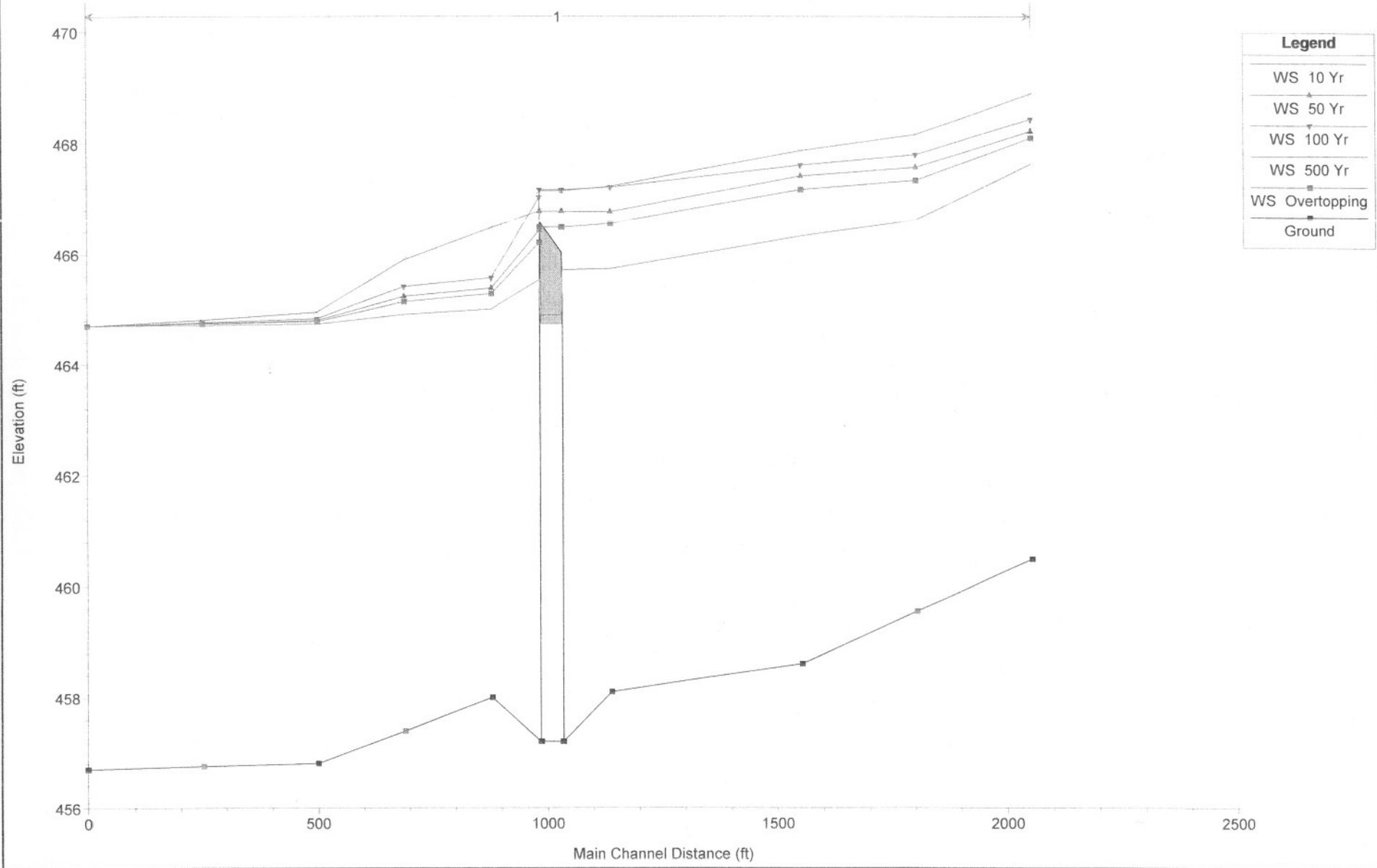
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Stream

Reach	River Sta.	Contr.	Expan.
1	3000	.1	.3
1	2750.*	.1	.3
1	2500	.1	.3
1	2100	.3	.5
1	2025	.3	.5
1	2000	Bridge	
1	1975	.3	.5
1	1900	.3	.5
1	1697.33*	.1	.3
1	1500	.1	.3
1	1234.04*	.1	.3
1	1000	.1	.3



Illinois Rte. 71 Over Intermittent Stream Plan: 1) PropSpill



HEC-RAS River: Stream Reach: 1

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	3000	10 Yr	UnconProp	1370.00	460.50	467.65		468.40	0.003855	7.47	331.27	285.73	0.58
1	3000	10 Yr	PropSpill	1370.00	460.50	467.64	467.01	468.40	0.003939	7.54	325.98	283.67	0.59
1	3000	50 Yr	UnconProp	2110.00	460.50	468.30	468.27	469.14	0.004334	8.59	540.28	358.01	0.63
1	3000	50 Yr	PropSpill	2110.00	460.50	468.22		469.14	0.004764	8.91	510.75	348.71	0.66
1	3000	100 Yr	UnconProp	2420.00	460.50	468.50	468.50	469.38	0.004603	9.05	610.99	379.36	0.66
1	3000	100 Yr	PropSpill	2420.00	460.50	468.44		469.38	0.004883	9.26	590.92	373.43	0.67
1	3000	500 Yr	UnconProp	3160.00	460.50	468.90		469.91	0.005210	10.06	777.26	456.05	0.70
1	3000	500 Yr	PropSpill	3160.00	460.50	468.89		469.91	0.005263	10.10	772.52	453.25	0.71
1	3000	Overtopping	UnconProp	1935.00	460.50	468.17		468.99	0.004223	8.35	494.69	343.55	0.62
1	3000	Overtopping	PropSpill	1935.00	460.50	468.10		468.99	0.004595	8.63	469.60	335.32	0.65
1	2750.*	10 Yr	UnconProp	1370.00	459.55	466.59		467.36	0.004486	7.53	323.38	342.61	0.62
1	2750.*	10 Yr	PropSpill	1370.00	459.55	466.62		467.36	0.004311	7.42	333.85	345.69	0.61
1	2750.*	50 Yr	UnconProp	2110.00	459.55	467.28		468.02	0.004413	8.20	585.98	431.34	0.63
1	2750.*	50 Yr	PropSpill	2110.00	459.55	467.57		468.08	0.003044	7.07	721.44	474.62	0.53
1	2750.*	100 Yr	UnconProp	2420.00	459.55	467.54		468.24	0.004168	8.23	705.94	469.87	0.62
1	2750.*	100 Yr	PropSpill	2420.00	459.55	467.80		468.30	0.003049	7.26	832.31	506.74	0.53
1	2750.*	500 Yr	UnconProp	3160.00	459.55	468.09		468.70	0.003693	8.26	987.72	548.58	0.59
1	2750.*	500 Yr	PropSpill	3160.00	459.55	468.16		468.72	0.003432	8.02	1023.53	557.78	0.57
1	2750.*	Overtopping	UnconProp	1935.00	459.55	467.12		467.89	0.004541	8.15	519.13	408.29	0.64
1	2750.*	Overtopping	PropSpill	1935.00	459.55	467.34		467.92	0.003422	7.28	614.11	440.67	0.56
1	2500	10 Yr	UnconProp	1370.00	458.60	466.13		466.43	0.002315	5.36	580.66	460.68	0.44
1	2500	10 Yr	PropSpill	1370.00	458.60	466.33		466.55	0.001741	4.78	673.15	480.36	0.39
1	2500	50 Yr	UnconProp	2110.00	458.60	466.98		467.20	0.001752	5.22	1005.61	543.34	0.40
1	2500	50 Yr	PropSpill	2110.00	458.60	467.42		467.55	0.001049	4.26	1255.21	586.03	0.31
1	2500	100 Yr	UnconProp	2420.00	458.60	467.25		467.47	0.001666	5.27	1158.42	569.86	0.39
1	2500	100 Yr	PropSpill	2420.00	458.60	467.61		467.76	0.001117	4.50	1372.00	604.97	0.32
1	2500	500 Yr	UnconProp	3160.00	458.60	467.79		468.00	0.001579	5.45	1482.87	622.42	0.39
1	2500	500 Yr	PropSpill	3160.00	458.60	467.87		468.06	0.001465	5.30	1530.90	631.78	0.37
1	2500	Overtopping	UnconProp	1935.00	458.60	466.80		467.04	0.001831	5.22	912.57	526.55	0.40
1	2500	Overtopping	PropSpill	1935.00	458.60	467.17		467.32	0.001165	4.36	1114.62	562.39	0.33
1	2100	10 Yr	UnconProp	1370.00	458.10	465.37		465.63	0.001498	5.15	618.45	331.24	0.37
1	2100	10 Yr	PropSpill	1370.00	458.10	465.73	463.85	465.95	0.001153	4.70	541.19	423.07	0.33
1	2100	50 Yr	UnconProp	2110.00	458.10	466.03		466.39	0.002000	6.38	891.29	497.89	0.43
1	2100	50 Yr	PropSpill	2110.00	458.10	466.77	464.63	467.04	0.001284	5.48	757.63	661.74	0.35
1	2100	100 Yr	UnconProp	2420.00	458.10	466.31		466.67	0.002005	6.56	1041.55	568.64	0.44

Backwater @ River Station 2100

10 yr 465.73 - 465.37 = 0.36'

50 yr 466.77 - 466.03 = 0.74'

100 yr 467.21 - 466.31 = 0.90'

500 yr 467.23 - 467.00 = 0.23'

OVERTOPPING 466.55 - 465.87 = 0.68'

HEC-RAS River: Stream Reach: 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	2100	100 Yr	PropSpill	2420.00	458.10	467.21	464.86	467.35	0.000811	4.52	1634.81	747.51	0.28
1	2100	500 Yr	UnconProp	3160.00	458.10	467.00		467.29	0.001709	6.45	1477.91	705.48	0.41
1	2100	500 Yr	PropSpill	3160.00	458.10	467.23	465.49	467.46	0.001357	5.86	1649.70	751.37	0.37
1	2100	Overtopping	UnconProp	1935.00	458.10	465.87		466.22	0.001957	6.21	814.08	456.93	0.43
1	2100	Overtopping	PropSpill	1935.00	458.10	466.55	464.48	466.80	0.001223	5.24	710.68	618.04	0.34
1	2025	10 Yr	PropSpill	1370.00	458.00	465.71	460.93	465.85	0.000408	3.00	461.53	417.18	0.20
1	2025	50 Yr	PropSpill	2110.00	458.00	466.78	461.87	466.89	0.000365	3.13	1367.83	663.37	0.20
1	2025	100 Yr	PropSpill	2420.00	458.00	467.17	462.20	467.29	0.000359	3.21	1639.96	738.91	0.20
1	2025	500 Yr	PropSpill	3160.00	458.00	467.15	462.97	467.35	0.000622	4.21	1624.24	734.76	0.26
1	2025	Overtopping	PropSpill	1935.00	458.00	466.49	461.64	466.71	0.000566	3.80	515.89	604.61	0.24
1	1975	10 Yr	PropSpill	1370.00	458.00	465.54	460.93	465.69	0.000443	3.08	449.98	330.79	0.21
1	1975	50 Yr	PropSpill	2110.00	458.00	466.43	461.84	466.70	0.000690	4.17	511.91	360.93	0.27
1	1975	100 Yr	PropSpill	2420.00	458.00	467.03	462.19	467.13	0.000328	3.03	1550.29	381.60	0.19
1	1975	500 Yr	PropSpill	3160.00	458.00	466.78	462.95	466.97	0.000646	4.16	1455.83	373.22	0.26
1	1975	Overtopping	PropSpill	1935.00	458.00	466.21	461.65	466.45	0.000641	3.94	496.60	353.48	0.26
1	1900	10 Yr	UnconProp	1370.00	458.00	465.09		465.27	0.001022	4.10	723.99	315.37	0.30
1	1900	10 Yr	PropSpill	1370.00	458.00	465.00	462.50	465.50	0.002091	5.81	301.97	312.43	0.42
1	1900	50 Yr	UnconProp	2110.00	458.00	465.60		465.88	0.001539	5.32	888.09	332.62	0.37
1	1900	50 Yr	PropSpill	2110.00	458.00	465.38	464.13	466.34	0.003816	8.19	341.66	325.43	0.58
1	1900	100 Yr	UnconProp	2420.00	458.00	465.84		466.14	0.001654	5.65	969.21	340.83	0.39
1	1900	100 Yr	PropSpill	2420.00	458.00	465.57	464.63	466.72	0.004434	9.00	361.16	331.81	0.63
1	1900	500 Yr	UnconProp	3160.00	458.00	466.45		466.78	0.001754	6.17	1183.22	361.58	0.40
1	1900	500 Yr	PropSpill	3160.00	458.00	466.48	465.54	466.81	0.001716	6.12	1194.13	362.61	0.40
1	1900	Overtopping	UnconProp	1935.00	458.00	465.46		465.72	0.001454	5.10	843.78	328.05	0.36
1	1900	Overtopping	PropSpill	1935.00	458.00	465.28	463.47	466.13	0.003439	7.69	330.97	321.93	0.55
1	1697.33*	10 Yr	UnconProp	1370.00	457.39	464.91		465.08	0.000892	4.03	713.20	259.43	0.28
1	1697.33*	10 Yr	PropSpill	1370.00	457.39	464.91		465.08	0.000892	4.03	713.20	259.43	0.28
1	1697.33*	50 Yr	UnconProp	2110.00	457.39	465.23		465.55	0.001629	5.63	797.98	265.96	0.39
1	1697.33*	50 Yr	PropSpill	2110.00	457.39	465.23		465.55	0.001628	5.63	798.23	265.98	0.39
1	1697.33*	100 Yr	UnconProp	2420.00	457.39	465.40		465.78	0.001874	6.14	844.24	269.46	0.42
1	1697.33*	100 Yr	PropSpill	2420.00	457.39	465.41		465.78	0.001862	6.13	846.58	269.64	0.42
1	1697.33*	500 Yr	UnconProp	3160.00	457.39	465.90		466.36	0.002237	7.04	980.56	284.38	0.46
1	1697.33*	500 Yr	PropSpill	3160.00	457.39	465.90		466.36	0.002238	7.04	980.32	284.34	0.46
1	1697.33*	Overtopping	UnconProp	1935.00	457.39	465.14		465.43	0.001475	5.31	773.31	264.08	0.37

HEC-RAS River: Stream Reach: 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
1	1697.33*	Overtopping	PropSpill	1935.00	457.39	465.14		465.42	0.001475	5.31	773.18	264.07	0.37
1	1500	10 Yr	UnconProp	1370.00	456.80	464.73		464.91	0.000830	4.05	677.15	209.56	0.28
1	1500	10 Yr	PropSpill	1370.00	456.80	464.73		464.91	0.000830	4.05	677.15	209.56	0.28
1	1500	50 Yr	UnconProp	2110.00	456.80	464.80		465.19	0.001874	6.13	691.23	210.46	0.42
1	1500	50 Yr	PropSpill	2110.00	456.80	464.80		465.19	0.001872	6.13	691.47	210.47	0.42
1	1500	100 Yr	UnconProp	2420.00	456.80	464.82		465.33	0.002433	7.00	694.95	210.69	0.48
1	1500	100 Yr	PropSpill	2420.00	456.80	464.83		465.34	0.002406	6.97	698.17	210.90	0.48
1	1500	500 Yr	UnconProp	3160.00	456.80	464.95		465.75	0.003770	8.82	722.94	212.47	0.60
1	1500	500 Yr	PropSpill	3160.00	456.80	464.95		465.75	0.003777	8.83	722.37	212.43	0.60
1	1500	Overtopping	UnconProp	1935.00	456.80	464.78		465.11	0.001600	5.65	686.82	210.17	0.39
1	1500	Overtopping	PropSpill	1935.00	456.80	464.78		465.11	0.001601	5.65	686.69	210.17	0.39
1	1234.04*	10 Yr	UnconProp	1370.00	456.75	464.71		464.77	0.000298	2.52	1139.13	316.11	0.17
1	1234.04*	10 Yr	PropSpill	1370.00	456.75	464.71		464.77	0.000298	2.52	1139.13	316.11	0.17
1	1234.04*	50 Yr	UnconProp	2110.00	456.75	464.75		464.89	0.000689	3.84	1150.90	316.74	0.26
1	1234.04*	50 Yr	PropSpill	2110.00	456.75	464.75		464.89	0.000690	3.84	1149.97	316.69	0.26
1	1234.04*	100 Yr	UnconProp	2420.00	456.75	464.75		464.93	0.000906	4.40	1150.90	316.74	0.30
1	1234.04*	100 Yr	PropSpill	2420.00	456.75	464.76		464.94	0.000899	4.39	1154.51	316.93	0.30
1	1234.04*	500 Yr	UnconProp	3160.00	456.75	464.81		465.11	0.001480	5.66	1170.05	317.76	0.39
1	1234.04*	500 Yr	PropSpill	3160.00	456.75	464.81		465.11	0.001484	5.67	1168.96	317.70	0.39
1	1234.04*	Overtopping	UnconProp	1935.00	456.75	464.74		464.86	0.000584	3.53	1147.58	316.56	0.24
1	1234.04*	Overtopping	PropSpill	1935.00	456.75	464.74		464.86	0.000584	3.53	1147.49	316.56	0.24
1	1000	10 Yr	UnconProp	1370.00	456.70	464.70	460.76	464.73	0.000139	1.75	1657.61	408.28	0.12
1	1000	10 Yr	PropSpill	1370.00	456.70	464.70	460.76	464.73	0.000139	1.75	1657.61	408.28	0.12
1	1000	50 Yr	UnconProp	2110.00	456.70	464.70	461.60	464.76	0.000331	2.69	1657.61	408.28	0.18
1	1000	50 Yr	PropSpill	2110.00	456.70	464.70	461.60	464.76	0.000331	2.69	1657.61	408.28	0.18
1	1000	100 Yr	UnconProp	2420.00	456.70	464.70	461.76	464.78	0.000435	3.09	1657.61	408.28	0.21
1	1000	100 Yr	PropSpill	2420.00	456.70	464.70	461.76	464.78	0.000435	3.09	1657.61	408.28	0.21
1	1000	500 Yr	UnconProp	3160.00	456.70	464.70	462.15	464.84	0.000742	4.03	1657.61	408.28	0.28
1	1000	500 Yr	PropSpill	3160.00	456.70	464.70	462.15	464.84	0.000742	4.03	1657.61	408.28	0.28
1	1000	Overtopping	UnconProp	1935.00	456.70	464.70	461.19	464.75	0.000278	2.47	1657.61	408.28	0.17
1	1000	Overtopping	PropSpill	1935.00	456.70	464.70	461.19	464.75	0.000278	2.47	1657.61	408.28	0.17

HEC-RAS Plan: PropSpill River: Stream Reach: 1

Reach	River Sta	Profile	E.G. US. (ft)	Min El Prs (ft)	BR Open Area (sq ft)	Prs O WS (ft)	Q Total (cfs)	Min El Weir Flow (ft)	Q Weir (cfs)	Delta EG (ft)	BR Open Vel (ft/s)	Wr Flw Area (sq ft)
1	2000	10 Yr	465.85	464.90	383.26	465.71	1370.00	466.71		0.16	3.57	
1	2000	50 Yr	466.89	464.90	383.26		2110.00	466.71	417.87	0.20	4.42	233.53
1	2000	100 Yr	467.29	464.90	383.26		2420.00	466.71	1161.65	0.16	3.28	513.00
1	2000	500 Yr	467.35	464.90	383.26		3160.00	466.71	1303.09	0.38	4.85	563.05
1	2000	Overtopping	466.71	464.90	383.26		1935.00	466.71	210.00	0.26	4.55	134.27

EXHIBIT 5

SCOUR ANALYSIS

EXISTING BRIDGE 50 YEAR FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	8.48
Velocity Upstream (ft/s):	3.33
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.24
Froude #:	0.20
Equation:	CSU equation

Abutment Scour

	Left	Right
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Input Data

Station at Toe (ft):	991.10	1041.13
Toe Sta at appr (ft):	991.10	1011.13
Abutment Length (ft):	566.72	144.72
Depth at Toe (ft):	9.48	8.09
K1 Shape Coef:	0.82 - Vert. with wing walls	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	566.72	144.72
Avg Depth Obstructed Ya (ft):	1.96	2.05
Flow Obstructed Qe (cfs):	1063.93	337.03
Area Obstructed Ae (sq ft):	1111.36	296.35

Results

Scour Depth Ys (ft):	31.36	9.22
Qe/Ae = Ve:	0.00	1.14
Froude #:	0.17	0.14
Equation:	HIRE	Froehlich

EXISTING BRIDGE - 100 YEAR FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	8.72
Velocity Upstream (ft/s):	3.54
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.37
Froude #:	0.21
Equation:	CSU equation

Abutment Scour

	Left	Right
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Input Data

	Left	Right
Station at Toe (ft):	991.10	1041.13
Toe Sta at appr (ft):	991.10	1011.13
Abutment Length (ft):	603.81	152.74
Depth at Toe (ft):	9.72	8.32
K1 Shape Coef:	0.82 - Vert. with wing walls	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	603.81	152.74
Avg Depth Obstructed Ya (ft):	2.07	2.17
Flow Obstructed Qe (cfs):	1263.13	395.10
Area Obstructed Ae (sq ft):	1247.04	330.83

Results

	Left	Right
Scour Depth Ys (ft):	32.66	9.85
Qe/Ae = Ve:	0.00	1.19
Froude #:	0.18	0.14
Equation:	HIRE	Froehlich

EXISTING BRIDGE - 500 YEAR FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	8.75
Velocity Upstream (ft/s):	4.57
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.87
Froude #:	0.27
Equation:	CSU equation

Abutment Scour

Input Data

	Left	Right
Station at Toe (ft):	991.10	1041.13
Toe Sta at appr (ft):	991.10	1011.13
Abutment Length (ft):	615.92	155.36
Depth at Toe (ft):	9.75	8.36
K1 Shape Coef:	0.82 - Vert. with wing walls	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	615.92	155.36
Avg Depth Obstructed Ya (ft):	2.10	2.20
Flow Obstructed Qe (cfs):	1666.73	519.25
Area Obstructed Ae (sq ft):	1293.19	342.49

Results

Scour Depth Ys (ft):	35.64	11.18
Qe/Ae = Ve:	0.00	1.52
Froude #:	0.23	0.18
Equation:	HIRE	Froehlich

EXISTING BRIDGE - OVERTOPPING FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	7.82
Velocity Upstream (ft/s):	4.85
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.92
Froude #:	0.31
Equation:	CSU equation

Abutment Scour

Input Data

	Left	Right
Station at Toe (ft):	991.10	1041.13
Toe Sta at appr (ft):	991.10	1011.13
Abutment Length (ft):	488.18	127.14
Depth at Toe (ft):	8.82	7.42
K1 Shape Coef:	0.82 - Vert. with wing walls	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	488.18	127.14
Avg Depth Obstructed Ya (ft):	1.75	1.81
Flow Obstructed Qe (cfs):	616.44	337.88
Area Obstructed Ae (sq ft):	852.43	229.50

Results

Scour Depth Ys (ft):	33.44	9.49
Qe/Ae = Ve:	0.00	1.47
Froude #:	0.25	0.19
Equation:	HIRE	Froehlich

PROPOSED BRIDGE - 50 YEAR FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	8.78
Velocity Upstream (ft/s):	3.35
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.27
Froude #:	0.20
Equation:	CSU equation

Abutment Scour

Input Data

	Left	Right
Station at Toe (ft):	982.57	1049.50
Toe Sta at appr (ft):	988.97	1016.10
Abutment Length (ft):	507.27	127.35
Depth at Toe (ft):	3.28	3.27
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	507.27	127.35
Avg Depth Obstructed Ya (ft):	1.78	1.73
Flow Obstructed Qe (cfs):	727.79	279.28
Area Obstructed Ae (sq ft):	902.88	219.80

Results

Scour Depth Ys (ft):	5.63	5.56
Froude #:	0.08	0.08
Equation:	HIRE	HIRE

PROPOSED BRIDGE - 100 YEAR FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	9.17
Velocity Upstream (ft/s):	3.43
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.33
Froude #:	0.20
Equation:	CSU equation

Abutment Scour

Input Data

	Left	Right
Station at Toe (ft):	982.57	1049.50
Toe Sta at appr (ft):	988.97	1016.10
Abutment Length (ft):	577.78	142.60
Depth at Toe (ft):	3.67	3.66
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	577.78	142.60
Avg Depth Obstructed Ya (ft):	1.98	1.96
Flow Obstructed Qe (cfs):	1170.92	284.51
Area Obstructed Ae (sq ft):	1141.98	279.28

Results

Scour Depth Ys (ft):	6.36	6.29
Froude #:	0.08	0.08
Equation:	HIRE	HIRE

PROPOSED BRIDGE - 500 YEAR FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	9.15
Velocity Upstream (ft/s):	4.51
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.87
Froude #:	0.26
Equation:	CSU equation

Abutment Scour

Input Data

	Left	Right
Station at Toe (ft):	982.57	1049.50
Toe Sta at appr (ft):	988.97	1016.10
Abutment Length (ft):	580.96	143.29
Depth at Toe (ft):	3.65	3.64
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	580.96	143.29
Avg Depth Obstructed Ya (ft):	1.99	1.97
Flow Obstructed Qe (cfs):	1534.26	373.01
Area Obstructed Ae (sq ft):	1153.49	282.12

Results

Scour Depth Ys (ft):	6.90	6.85
Froude #:	0.10	0.10
Equation:	HIRE	HIRE

PROPOSED BRIDGE - OVERTOPPING FLOW

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	2.50
Grain Size D50 (ft):	0.06000
Depth Upstream (ft):	8.49
Velocity Upstream (ft/s):	4.07
K1 Nose Shape:	1.00
Pier Angle:	0.00
Pier Length (ft):	47.17
K2 Angle Coef:	1.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (ft):	0.10000
K4 Armouring Coef:	1.00

Results

Scour Depth Ys (ft):	4.62
Froude #:	0.25
Equation:	CSU equation

Abutment Scour

Input Data

	Left	Right
Station at Toe (ft):	982.57	1049.50
Toe Sta at appr (ft):	988.97	1016.10
Abutment Length (ft):	472.49	118.43
Depth at Toe (ft):	2.99	2.98
K1 Shape Coef:	0.55 - Spill-through abutment	
Degree of Skew (degrees):	90.00	90.00
K2 Skew Coef:	1.00	1.00
Projected Length L' (ft):	472.49	118.43
Avg Depth Obstructed Ya (ft):	1.69	1.63
Flow Obstructed Qe (cfs):	650.07	260.55
Area Obstructed Ae (sq ft):	796.40	193.03

Results

Scour Depth Ys (ft):	5.86	5.81
Froude #:	0.12	0.11
Equation:	HIRE	HIRE

EXHIBIT 6

SURVEY NOTES

16. Page 71
S.N. 050-0030
Intermittent Stream
Bench Loop

①

WHA # 1212001

J. Healey
M. Alessi

3/18/02

NO. 456

ELECTRONIC INSTRUMENT

[471.08]

(3)

New BM

4.49

466.59

10' spike in 12" Tree

No. side of N. RT. 71

52' LT 104180

4.13

[470.72]

T.B.M. Top of 5" "

6.64

464.08

I.P. Control #1

Elev. 464.16

6.96

[471.04]

BM CHS. "I" on the s/e

3.87

467.17

Wingwall of Exist. Bridge

S.N. 050-0030

26' RT. 99185

4.58

[471.75]

T.B.M. Top of 16" "

464.78

I.P. Control #2

5.80

[470.29]

New BM

8.32

461.97

CHS. "I" on s/e Cor.

of Headwall

33' RT 91183

7.90

[469.87]

T.P. #1

4.11

465.76

5.84

[471.60]

New BM

4.43

467.17

CHS. "I" on the s/e

Wingwall of Exist. Bridge

S.N. 050-0030

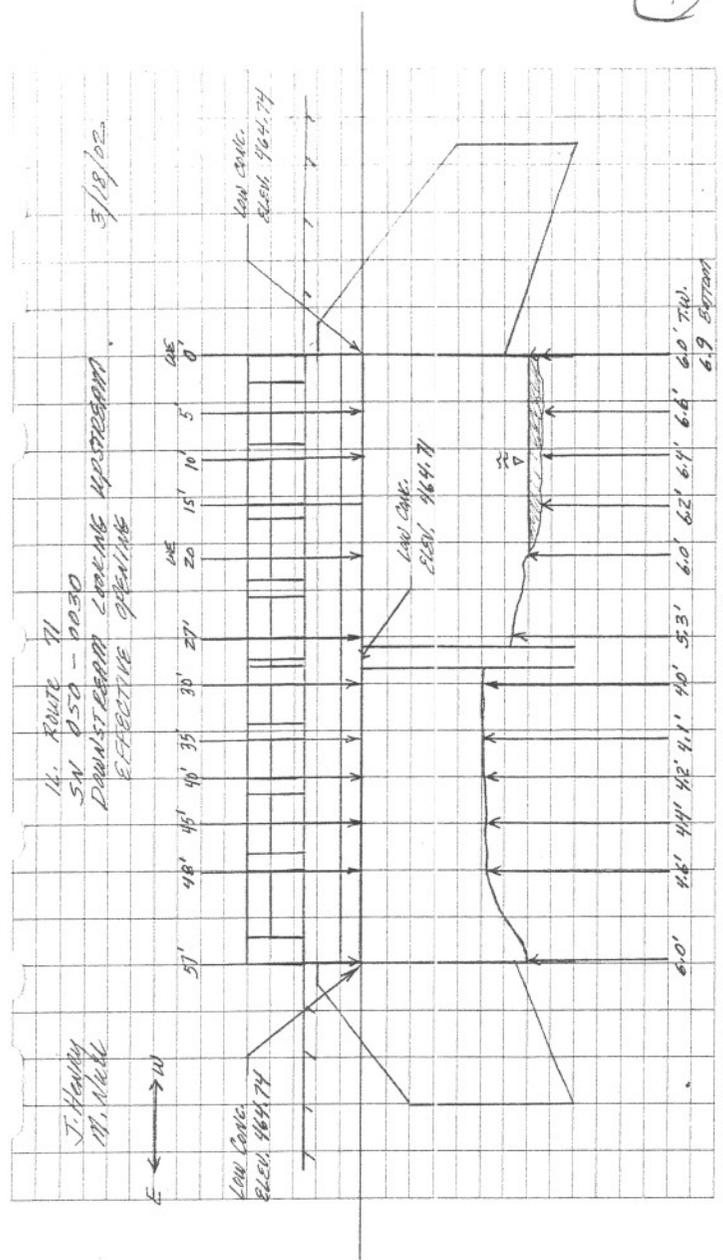
26' RT. 99185

3.91

[471.08]

(2)

7



6

Conc. Substructure - Good Condition
 Not many Cracks
 Roadway Surface - Good Condition
 Handicap & Curbs - Conc. - Good Condition

9

10. Route 71

S.N. 050 - 0530

Intermittent stream

Low Conc. Elevations

J. Henry
M. Null

3/18/02

8

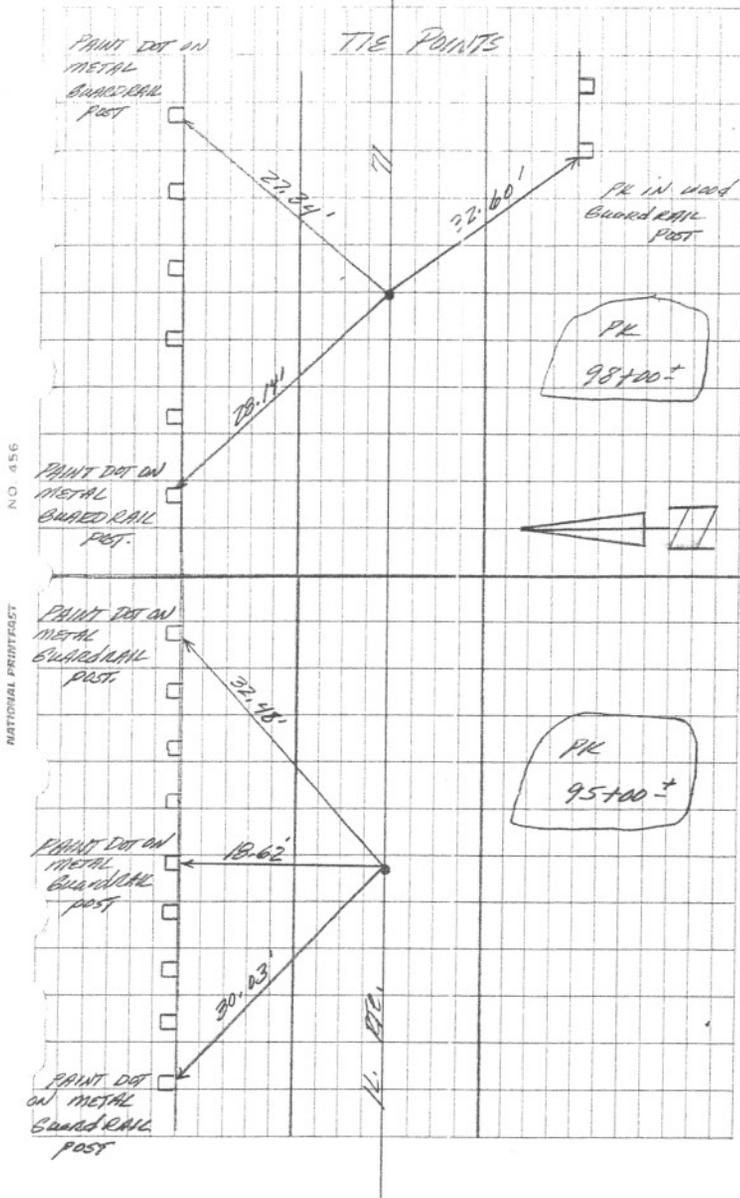
NO. 456

RATIONAL PRINTSET

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N. ROUTE 71
S.N. 050-0230

TIE POINTS



NO 456

NATIONAL HIGHWAY

10

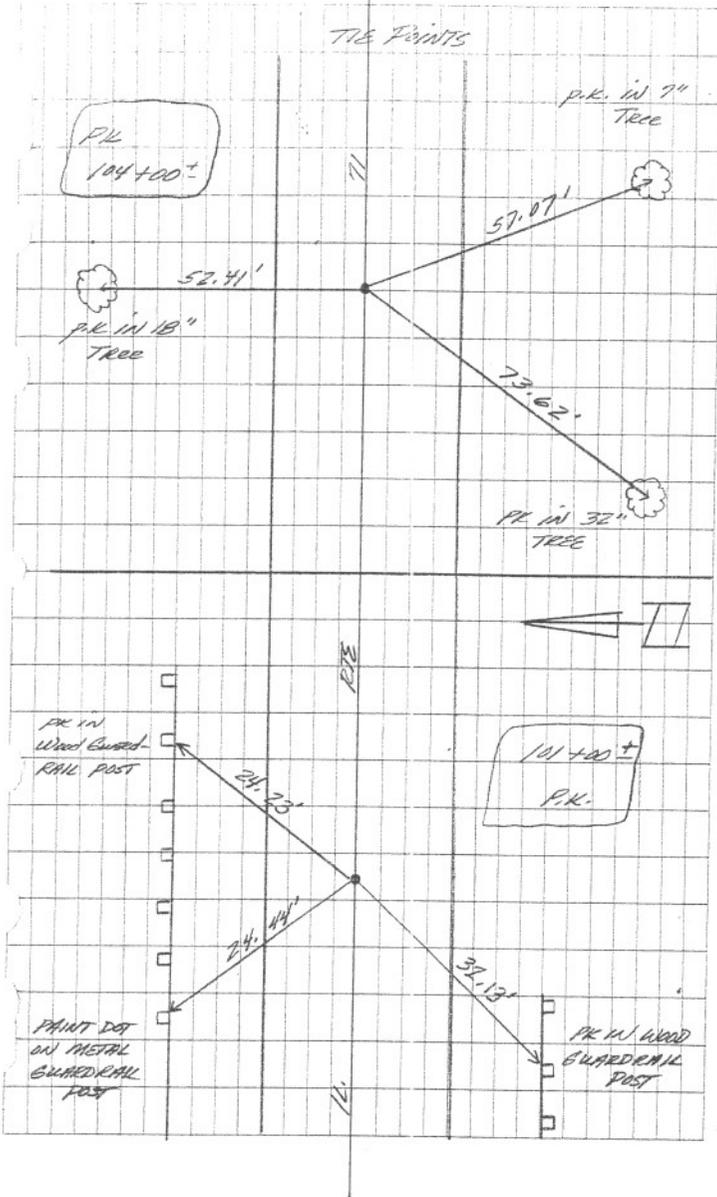
ERM CHIS. II on the s/e		467.17
Wingwall of EXIST. Bridge		
S.N. 050 - 0030		
26' RT. 99+85		
	3.47 [470.64]	
N/W Cor. of Bridge	5.90 (464.74)	
N/E Cor. of Bridge	5.90 (464.74)	
s/e Cor. of Bridge	5.94 (464.70)	
s/w Cor. of Bridge	5.90 (464.74)	
No. End Pier	5.93 (464.71)	
So. End Pier	5.90 (464.74)	
ERM CHIS. II on the s/e	3.47	467.17
Wingwall of EXIST. Bridge		±0.00
S.N. 050 - 0030		
Elev. 467.17		

16. POINTS 71
S.N. 050-0030

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TRE POINTS



NO. 456

NATIONAL INSTRUMENTS

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N. Route 71

S.N. 050-0030

INTERMITTENT Stream

Roadway Topo + X-sections

J. Henry

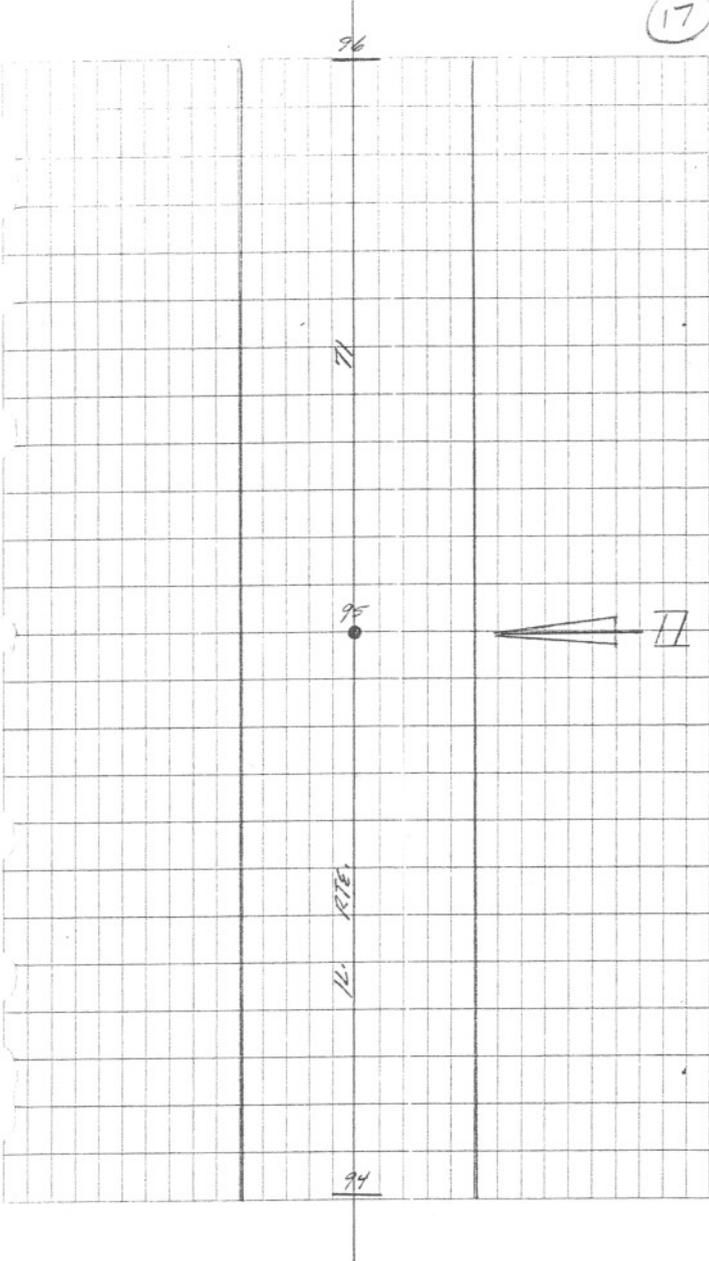
3/19/02

M. Wall

NO. 456

NATIONAL PRINTING

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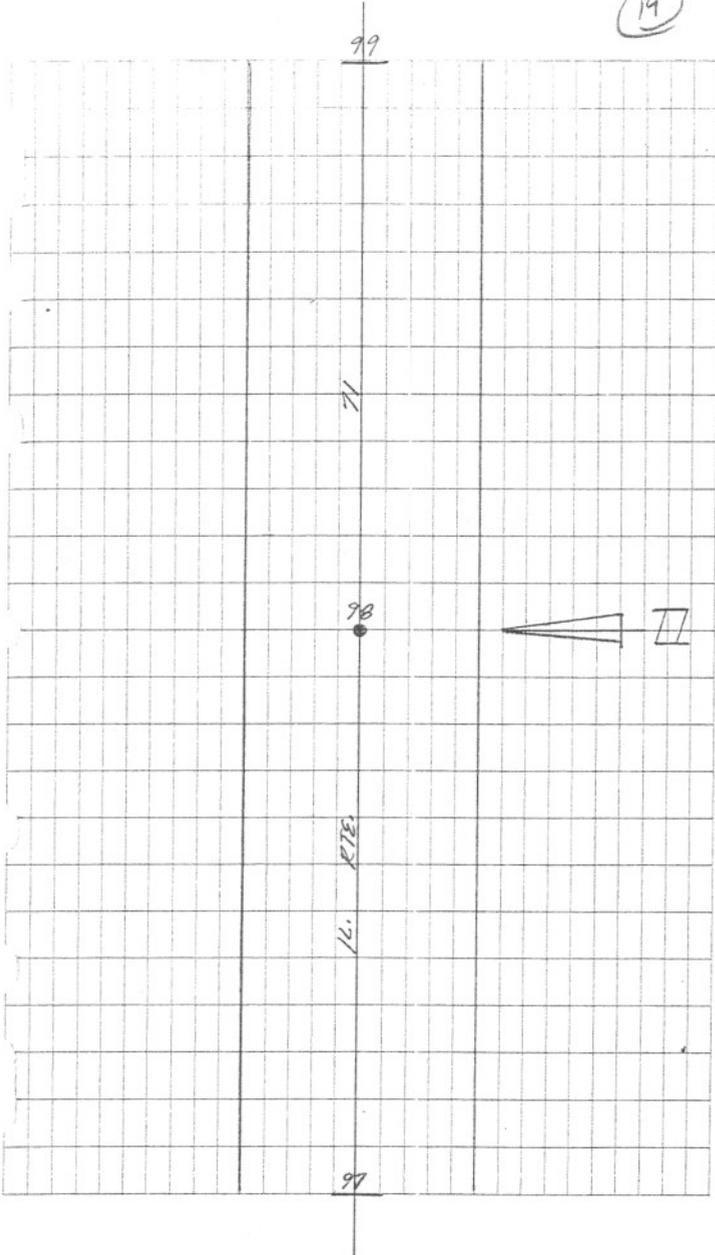


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89+00	1007	1006	1000	1001	1002	1003	1004	1005
	1009	1010						
90+00				1011				
91+00				1012				
92+00				1013				
93+00				1014				
94+00	1022	1021	1020	1015	1016	1017	1018	1019
	1023	1024						
95+00		1029	1028	1025	1026	1027		
96+00		1034	1033	1030	1031	1032		

16

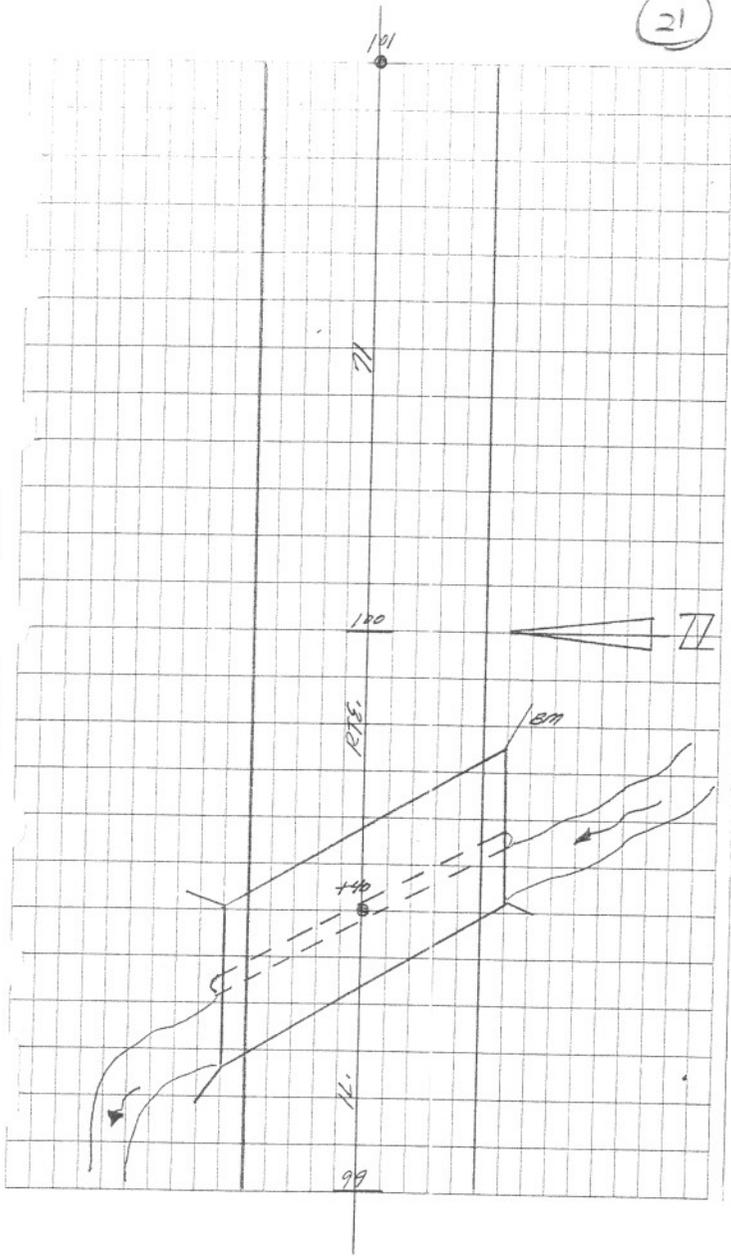
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97+00	1039	1038	1035	1036	1037
			0		
98+00	1044	1043	1040	1041	1042
			0 PK		
WING SEC. +79	WING 1050	1049	1047	1046	1045
				0	
	1051	1052			
99+00	1057	1056	1053	1054	1055
			0		

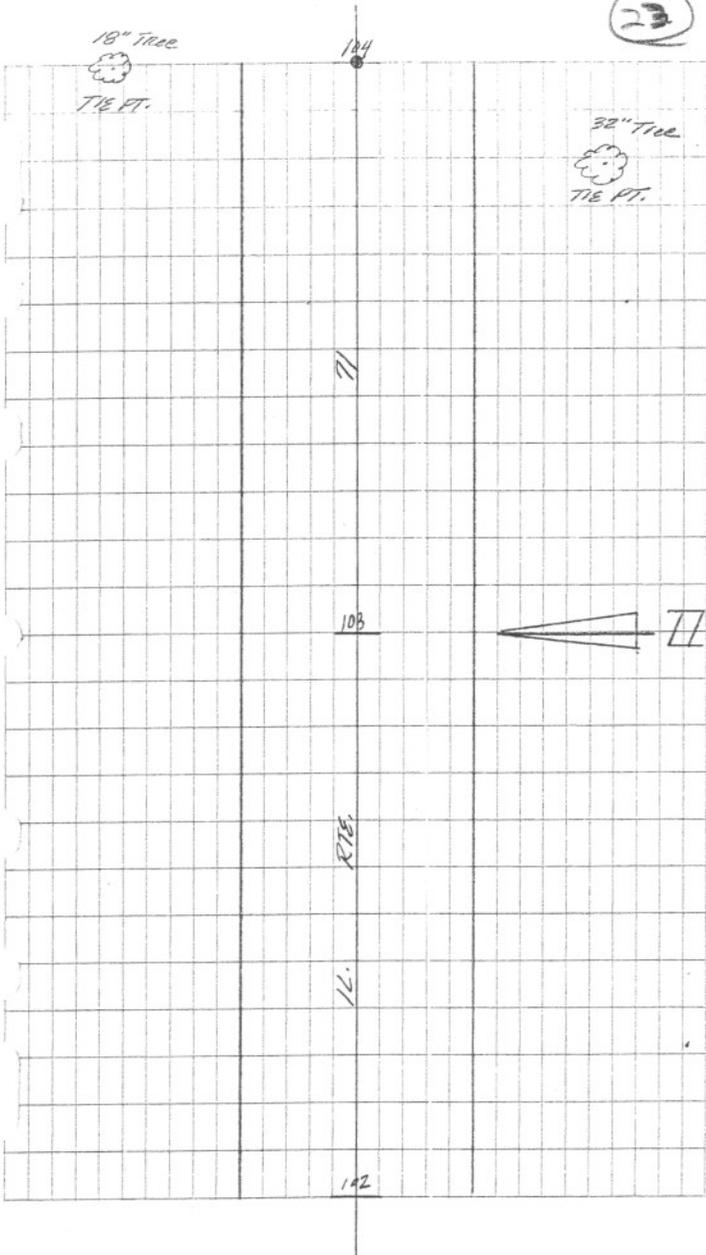
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WING SEC.					
99+21	$\frac{1060}{0}$	1061	1062	^{WING} 1063	1064 1065
+40	1068	$\frac{1066}{PK}$	1067		
WING SEC.	^{WING} 1075	1074	1073	$\frac{1072}{0}$	
+61	1076	1077	1078		
100+00	$\frac{1086}{0}$	1085	1082	1083	1084
WING SEC.	$\frac{1087}{0}$	1088	1089	^{WING} 1090	1091 1092 1093
+02					
101+00	$\frac{1098}{0}$	1097	1094	1095	1096

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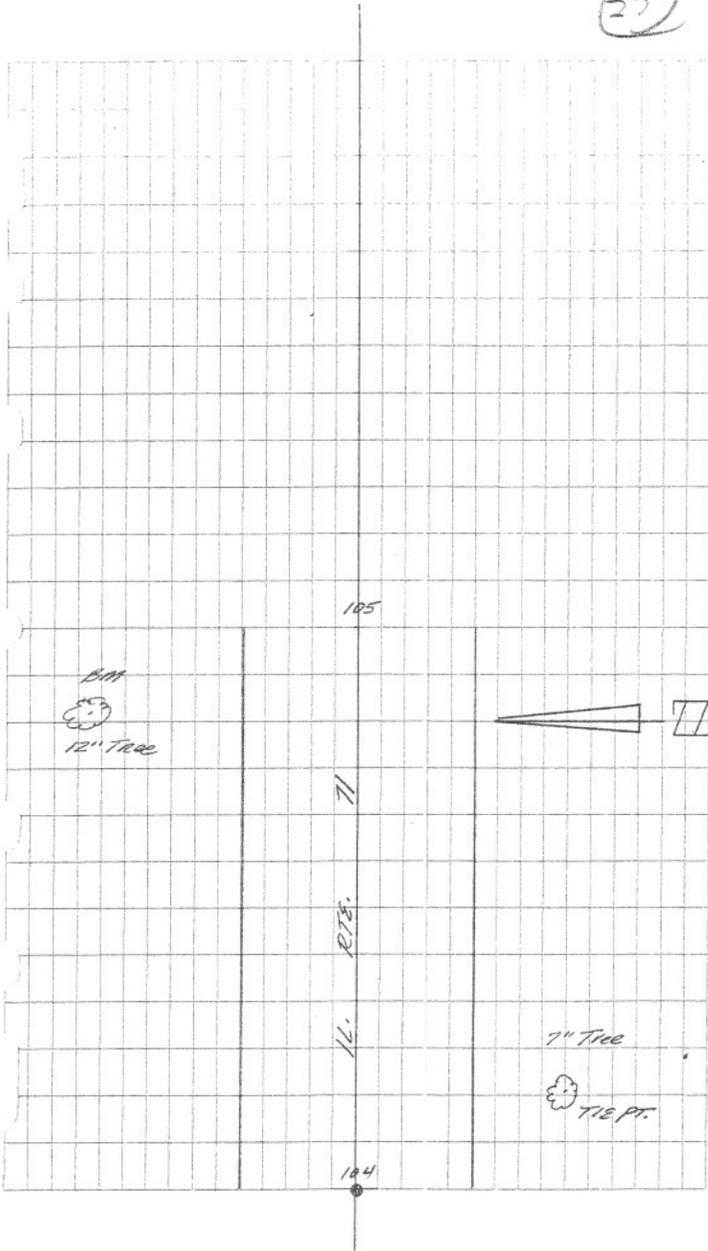
27

102+00	1103	1102	1099 0	1100	1101
103+00	1108	1107	1104 0	1105	1106
104+00	1114	1113	1110 0 PK	1111	1112

(25)

N.O. 456

NATIONAL PRINTFAST



(24)

105+00	1125	1124	1118	1119	1120	1121	1122
	1126	1127	1128				1123
106+00			1129				
107+00			1130				
108+00			1131				
109+00			1132				
110+00	1141	1140	1139	1133	1134	1135	1136
	1142	1143				1138	1137

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W. Route 71

S.N. 050-0030

Intermittent Stream

UPSTREAM & DOWNSTREAM Hydraulics

3/20/02

J. Henry

M. Nall

NO. 456

NATIONAL INSTRUMENT

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3/20/02

UPSTREAM

	TB (100) 2097 (10)	WE 2098	100' US 2092	WE 2093 (10)	TB 2094 (100)	2095
	2098 (100)	2099				
		2091	900' US 0.60			2090
		2088	800' US 1.00			2089
		2086	700' US 0.60			2087
		2085	600' US 0.80			2084
	TB (100) 2077 (10)	WE 2076 (13)	500' US 2074	WE 2081 (4)	TB 2082 (200)	2083
	(100) 2078 (130)					
	2080 (75)	2079	400' US 0.70			2072
		2070	300' US 0.60			2071
		2069	200' US 0.70			2068
	TB (100) 2065 (50)	WE 2062 (8)	100' US 2057	WE 2059 (3)	TB 2060 (200)	2065
	(75) 2064					
		2056				2055

16. RTE.

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3/20/02

DOWNSTREAM

	TB (100) 2013 (100)	WE 2012 (3)	2011	WE 2007 (10)	TB 2008 (4)	2009
	(100) 2014 (50)	2015				2010 (37)
	2017 (50)	2016 (50)				
		2018	200' US 0.50			2019
		2020	300' US 1.00			2021
		2022	400' US 1.30			2023
	TB (100) 2031 (100)	WE 2030 (4)	500' US 2024	WE 2025 (2)	TB 2026 (14)	2027
	(50) 2032 (50)	2033 (50)				2028 (14)
		2034				
		2035	600' US 1.90			2036
		2037	700' US 2.50			2038
		2039	800' US 2.00			2040
		2041	900' US 2.00			2042
	TB (100) 2045 (100)	WE 2044 (3)	1000' US 2050	WE 2051 (2)	TB 2052 (50)	2053
	(100) 2046 (100)	2047				2054 (50)
	2049 (50)	2048 (80)				

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EXHIBIT 7

COMPUTER DISK